

OS/2

M A G A Z I N E

Reviews

BackMaster

Desktop Observatory

System Commander

Workstation Test Tool

New
os/2[®]
Developer
Section!

Lotus notes

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Ground Up
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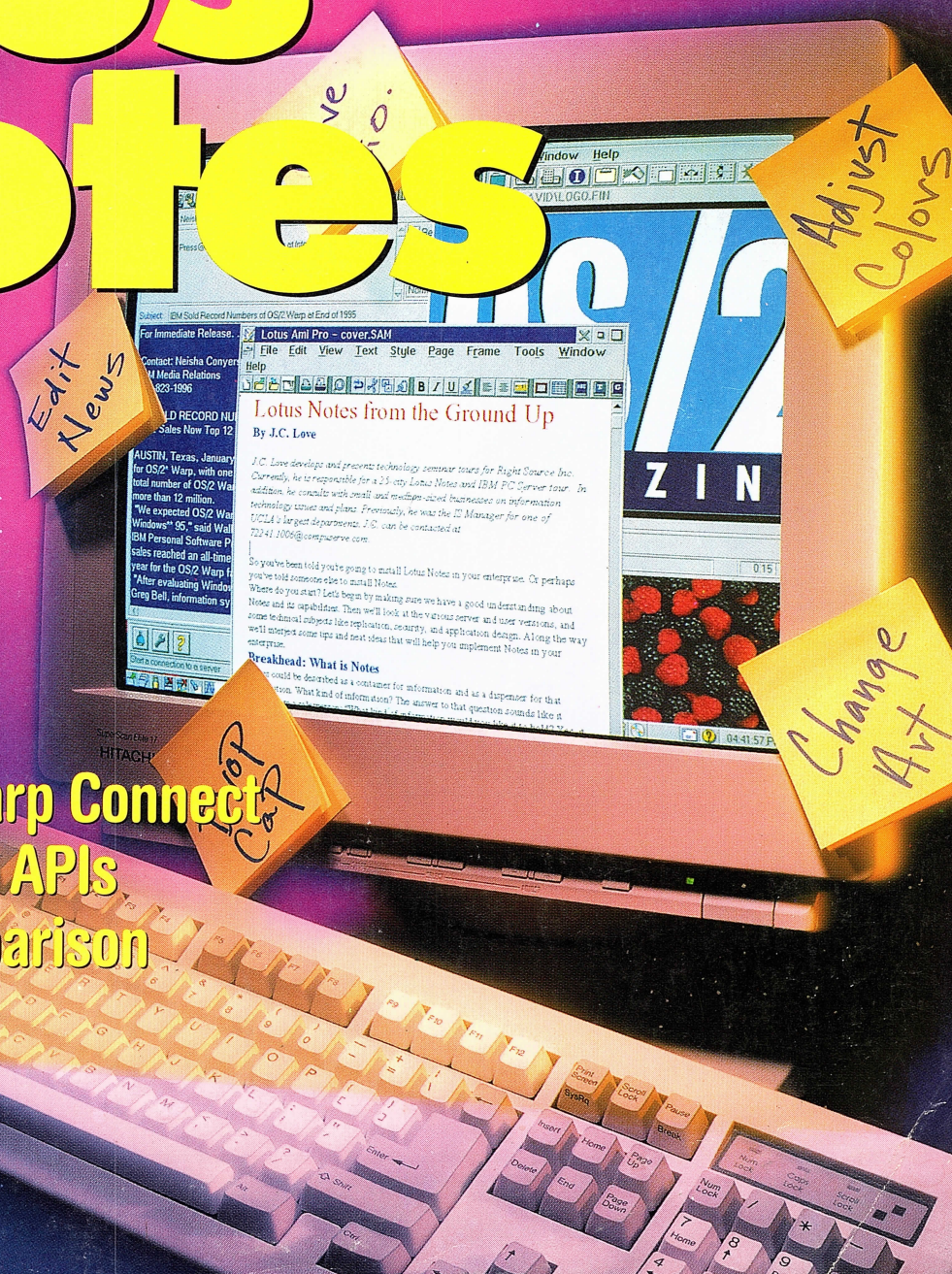
Plus

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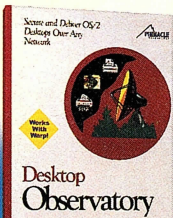
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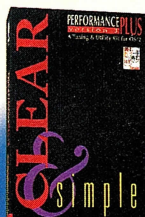
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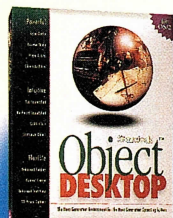
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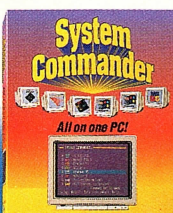
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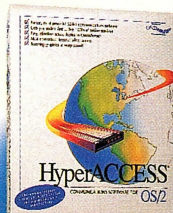
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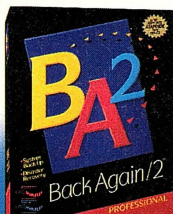
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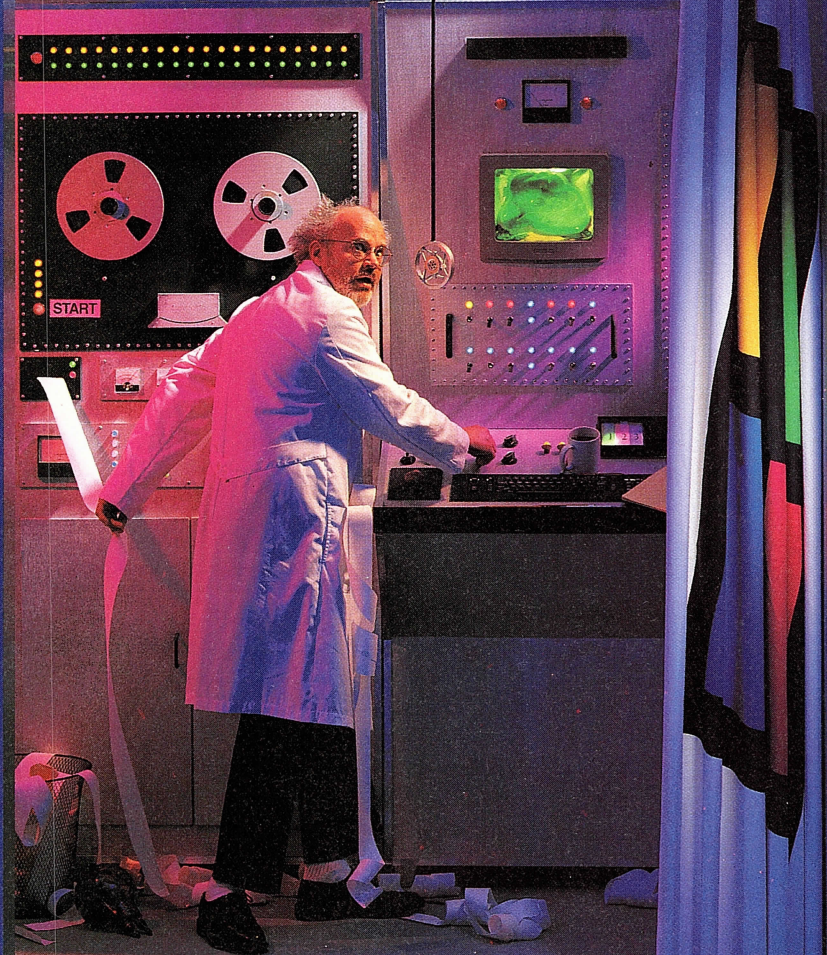
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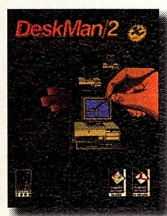
You might say that people are a little excited about our new releases..



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It's no wonder, really. When you take the product voted best in its category both in the United States and Internationally, listen to your customers, and apply all that you have learned, you can accomplish amazing things. So when we started with our best selling desktop management software, **DeskMan/2**, and enhanced all of the features you have come to depend upon, we knew that you'd be happy. But we didn't stop there. After all, since version 1.51b has ten times the functionality of the original release, you can imagine that **DeskMan/2** version 2.0 was to be something very special.

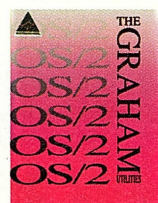
Now Available-DeskMan/2 version 2.0



Powerful new facilities, such as the MultiDesk™ Personal Desktop Facility, continuous Workplace Shell backup, live desktop synchronization, improved & expanded access control, user defined Workspaces, and context sensitive tools, are just a few of the enhancements we made to version 2.0. In addition, the familiar facilities for enhancing, managing, securing, backing up, standardizing, and personalizing the OS/2 desktop are all improved.

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Whether you need to enhance your productivity, manage & secure thousands of desktops (or just one), recover lost data, maximize your storage, recover from catastrophes, or just solve any of a million other daily tasks, **DevTech** has your solution, and the service to back it up.

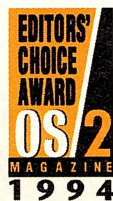
Under the circumstances, we suppose that a little excitement was only to be expected.

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OS/2 Magazine (ISSN #1073-1547) is published monthly by Miller Freeman Inc., 600 Harrison St., San Francisco, CA 94107, (415) 905-2200. SUBSCRIPTION RATE in the U.S. is \$39.95 for 12 issues. Canadian and Mexican orders must be prepaid in U.S. funds with additional postage at \$10 per year. All other countries must be prepaid in U.S. funds with additional postage at \$20 per year for surface mail or \$40 per year for air mail. Second-class postage paid at San Francisco, CA, and at additional mailing offices. POSTMASTER: Send address changes to OS/2 Magazine, P.O. Box 1079, Skokie, IL 60076-8079.

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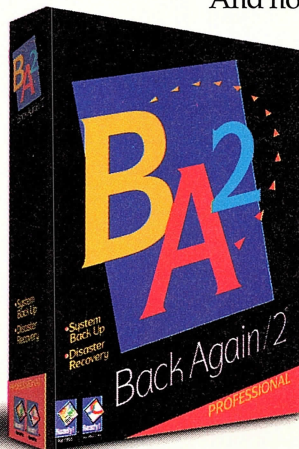


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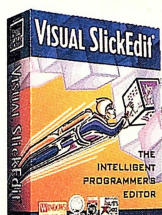
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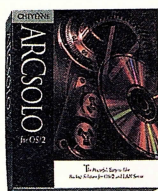
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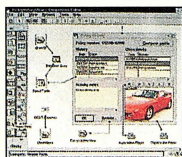
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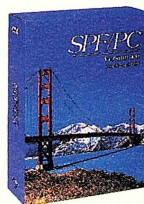


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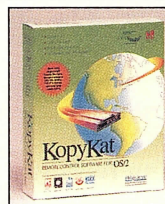


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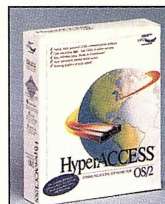
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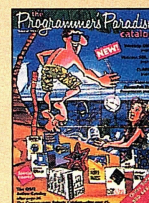
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Perspectives

Life and Hope

Last month, in "Road Kill," I painted a bleak picture of OS/2 Warp's year-end condition. Since then, I'm pleased to report that IBM's words and deeds appear to indicate a healthier future.

In late January, I attended the annual Lotus developer and business-partner conference (Lotusphere) in Orlando, Fla. This year's Lotusphere celebrated the new Notes Release 4 and rejoiced in the Internet, with the business-productivity applications hidden in the shadows.

Lotus' executives repeatedly proclaimed the division, "operating-system agnostic and aggressively multiplatform." Translating words into deeds, that means Windows dictates Lotus' strategy, but they will release functionally equivalent OS/2 versions of most products. For example, the Notes 4 OS/2 server was immediately available at the introduction; the OS/2 client was running a few months behind, with prerelease code on the conference CD-ROM. That's a darn sight better than Release 3's inexcusable 11-month delay, no?

At the conference, John M. Thompson, who heads the IBM Software Group (which includes Lotus and the Personal Software Products division), described his group's commitment to OS/2. His words: "The investment funds to develop and support IBM's platforms will continue to come." Oblique, yes, but Mr. Thompson's statement was perhaps the most encouraging yet by a top-level executive. He also stated that Lotus' cross-platform strategy is now IBM's overall software strategy.

On Lotusphere's packed show floor, nearly all business partners were showing Windows software—but you could find signs of OS/2 life there, too. At the back of the hall, a pedestal displayed a prebeta of SmartSuite 96 for OS/2. The Lotus OS/2 team is quite proud of their work, and justifiably. WordPro, the application nearest completion, shows incredible performance improvement over AmiPro. WordPro and Freelance are promised by April; 1-2-3 and Approach are expected by year's end. (The delays aren't entirely Lotus' fault. SmartSuite depends on the OS/2 Developer API Extensions, and DAX *still* isn't finished.)

The IBM Software Group also includes the Software Solutions (SWS) division—home of database and development tools. General manager Steve Mills has always been an outspoken OS/2 supporter, and he made his feelings crystal-clear in an internal IBM memorandum. Responding to reported public bad-mouthing of OS/2 Warp by SWS representatives, Mr. Mills struck back: "As we have discussed

repeatedly, OS/2 is the dominant 32-bit server operating system in the industry by a wide margin. In our largest accounts it has a 40 to 50% market share of the desktop."

He concluded, "We, as a division, are 1000% behind OS/2. I never want to hear that someone in SWS did not tell a strong story of commitment to OS/2. Based on FACTS, you never have to apologize or waver in support of OS/2."

Mr. Mills, on behalf of your customers: Thank you. (By the way, could you encourage Mr. Gerstner to be equally direct?)

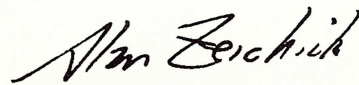
It's been an annual tradition, for the past half-decade, for technology journalists and industry analysts to declare that "OS/2 is dead." Wrong again! IBM's end-of-1995 figures showed an installed base of 12.7 million OS/2 licenses, six million of which are flavors of OS/2 Warp. In December alone, OS/2 Warp sold one million licenses. Not bad by any measure.

To put that in perspective, December's OS/2 Warp sales beat Microsoft's Windows NT sales for all of 1995, which International Data Corp. estimates at 840,000 licenses. (But of course OS/2 is still dead, right?)

Even the decision to commit to the Intel x86 platform (and bury the PowerPC port) is good news. That failed PowerPC initiative consumed tremendous resources in 1995. Now that PSP has shed that excess baggage, OS/2 Warp (Intel Edition) should fare much better in the battles ahead.

Finally, a moment of silence for OS/2 Professional magazine, which ceased publication after its February 1996 issue. OS/2 Professional first appeared in November 1992; its success helped our team build a business case for OS/2 Magazine's launch a year later.

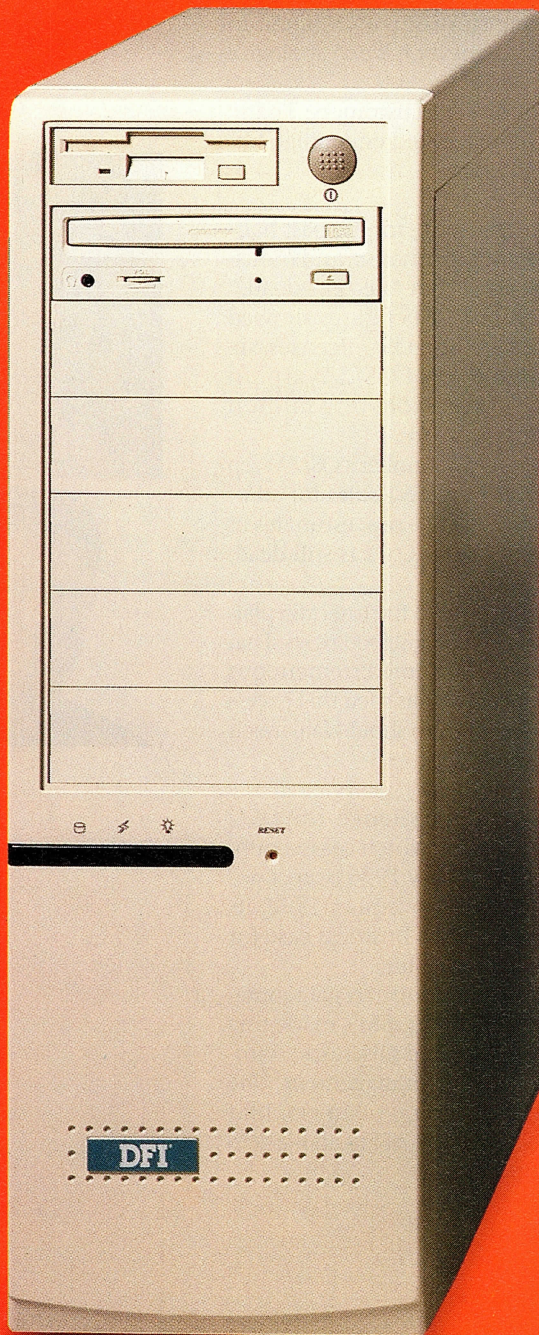
OS/2 Professional earned its controversial reputation by enthusiastically attacking IBM's marketing policies and by exposing suspected miscreants within Personal Software Products' management. The magazine's passing marks the end of an era: IBM executives won't have editor-in-chief Edwin Black to kick them around any more.



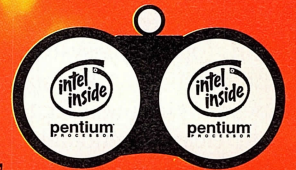
Alan Zeichick
Editor-in-Chief



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Letters

"So for now, my interpretation is that it's all systems go."

Straight Answers

Dear Editor:

I enjoyed Alan Zeichick's "Straight Answers" (*Perspectives*, February 1996, p.7), and I would like to offer some additional comments.

The question of OS/2 Warp in the small office/home office (SOHO) is settled by the technical attributes of OS/2 itself. Whatever the intentions of marketers, OS/2 is clearly optimized to facilitate the development and rapid deployment of custom and vertical applications, just as the Windows environment is optimized to the more general case of individual users and their consumer-oriented applications.

OS/2 Warp, within IBM, is much more widespread than you suggest. You neglect entirely the efforts of one of IBM's fastest-growing divisions, ISSC, which has a heavy workload of mission-critical applications under development for corporate customers who have chosen OS/2. These are not toy demos, but immense client/server systems that will impact the lives of millions. Systems of this sort show OS/2 in its best light.

OS/2 Warp, within IBM's hardware group, is a sore point for many fans. The fact is that the name of the company is the International Business Machines Corp. IBM is, was, and will likely remain, a business machine company. There will always be a market for a machine too economically designed to be really suited for OS/2 Warp. However, IBM surely plans to continue to service that market with reliable, lower-end machines that are backed by the IBM name. The reputation of IBM is based on being able to fill all business needs, not just "sexy" business needs.

In summary, when IBM executives say, "It's clear we're still committed to OS/2, and it's obvious our key customers understand our commitment," they are talking Bluespeak, a strange and private language to the IBM world—but it has meaning. They

mean, "IBM is a business. We can't swear we'll die to defend OS/2, because we won't. But it isn't dead yet, despite its failure to dominate the SOHO market. It's a great development platform that is the work of many good coders, good designers, and a few scattered geniuses who brought a 32-bit operating system a little ahead of its time. No good deed goes unpunished, so OS/2 has some public perception problems, but it serves a need and a market that Microsoft is still inept at serving."

So for now, my interpretation is that it's all systems go.

Jack Woehr

OS/2 2.x vs. OS/2 Warp users

Dear Editor:

In the January 1996 *Dateline:OS/2*, "OS/2 Numbers Updated," (p.11) the second paragraph contains the following quote:

"... IBM is due to cut off OS/2 2.x support early next year, as well as offer a number of technical add-ons... If this doesn't convince the remaining six million OS/2 users to upgrade, then not even IBM can claim that there are really 10 million users out there."

This remark ignores two important groups of OS/2 users, whose numbers are not known.

Many users now running OS/2 2.11 are quite happy with their system. Most don't want or need to divert their attention to the task of installing a new version of OS/2, whose newer features don't assist them. Having installed OS/2 previously, they may have a healthy respect for the problems that can arise during installation.

A number of users exist, like myself, who were unsuccessful in upgrading to OS/2 Warp from OS/2 2.11 and returned the product for a refund. Certainly there is evidence for their existence on some of the Internet-accessible news groups.

Douglas T. Lewis

While I don't doubt that there are satisfied users who continue to use and enjoy OS/2 2.x, they ultimately won't figure into the active OS/2 user base as newer technologies, which only work on versions of OS/2 Warp or later, are introduced. At some point, people either upgrade to continue running the latest software or they are effectively out of the market. IBM no longer counts licenses of OS/2 1.x in the user base. In the near future that will be true of OS/2 2.x licenses as well.

-Alexander Antoniadis

HPFS questions

Dear Editor:

After reading "Everything You Ever Wanted to Know About HPFS" (February 1996, p.26), I'd like to point out that HPFS allocates a minimum of 512 bytes for each file, which is the Fnode. So, a 1,024-byte file would actually take up 1,536 bytes of disk space, and a 0-byte file would take up 512 bytes of disk space.

Next, I have to ask about how HPFS386 utilizes a cache size greater than 2,048 kilobytes, given the claimed limitation of the IFS module in the OS/2 kernel. I notice that the line to load HPFS386 includes two file parameters (HPFS386.IFS and HPFS200.386). So, I figure that the second file has something to do with it, but I'd still like to hear from someone who knows more than I do.

Mike Ruskai

You are absolutely correct on your first point regarding HPFS cluster allocation. Oops.

In addition, the limitation on the HPFS cache size is really determined by the memory model used by the HPFS.IFS code. The HPFS386 is a separate code base (assembly language vs. 16-bit C) and has access to different memory allocation APIs during initialization and run time.

-Max Eidswick

Lock and Load!

CENTRALLY MANAGING, SECURING, AND DELIVERING AN OS/2 DESKTOP OVER ANY LAN **BY ERIC OSMANN**

OS/2 has become a corporate workhorse since its inception several years ago. Yet many questions have arisen on how to manage the workplace shell and, most important, secure it and the applications it helps launch.

There are a few tools which advocate their ability to manage the shell - most work best in a stand-alone mode. Still, the corporate environment demands efficient centralized management and security optimized for networks. This requirement, combined with my background in development of the OS/2 workplace shell, has led to a careful examination of OS/2 security and commitment to The Desktop Observatory by Pinnacle Technology. This paper discusses the requirements and the features built into Pinnacle's unique technology.

Requirements

Although pure file level security requires IBM's Security Enabling Services (Pinnacle has been a member of Beta efforts and is architected to support these key features already available for 2.11), there are critical elements in OS/2 security that go well beyond the simple ability to restrict right mouse button options. These include: 1) ease of creating desktops; 2) network design; 3) additional security elements; and 4) flexibility.

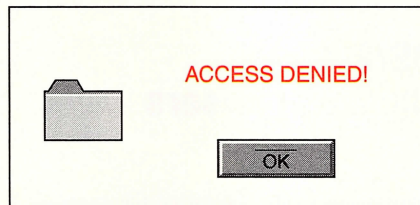
Ease

Pinnacle has developed a powerful SOM based tool called "Finder". Finder allows an administrator to quickly create a desktop, snap a picture of it (including all of those oblique DOS settings) and save it to Pinnacle's bandwidth-sensitive file (patent pending). Files can, of course, be saved anywhere on the network and instantly be built at any machine. There is no need for an administrator to know REXX, although those who do will appreciate Pinnacle's ability to associate

"events" (programs, etc.) with objects and the pure speed at which it builds desktops.

Network Design

The Desktop Observatory was designed with networks in mind. Administrators will appreciate Pinnacle's small file size of less than 10k per desktop and its ability to work over any protocol and NOS. With this bandwidth, lap tops can be secured over a phone line!



The Desktop Observatory is able to limit users to a centrally managed specific list of applications. User attempts to cleverly create objects via ProgMan, word processors, or REXX will result in a security violation!

Another feature of the Desktop Observatory is that it allows administration of OS/2 clients with the current security server for network based applications. Regardless what NOS is being utilized by a firm, The Desktop Observatory will not build an object unless it can resolve its security checks. It cannot resolve these check unless users are correctly authenticated. The result is a user gets his/her appropriate desktop *whenever and wherever* they log on and the administrator does not have to redundantly maintain rights. No desktop need be provided until *after* a user has been authenticated (those interested in Single Sign-On should contact Pinnacle).

More on Security

Auditing is a common requirement for the security conscious. A full capability is built into The Observatory. This is integrated with the security daemon which includes the ability to restrict clever users from building their own objects to violate client security. Also, great pains are taken to reduce all exposures between power-on and the workplace shell. A special program was created to start

the shell (dskshell.cmd), insure networking starts correctly, and inhibit user's ability to interrupt the process via a cntl-break. Disabling the Alt-Fx function is a feature that can be engaged, if desired. Users can enable their hardware boot protection in the bios or call Pinnacle for a centrally distributable software solution.

Flexibility

There are circumstances where corporations do not need high security and only need the ability for users to get the appropriate desktop. In fact, this may be combined with the need for users to be able to modify their own desktop yet move from machine to machine—or what some customers refer to as a "follow me" desktop. Pinnacle uses MID (Mobile Independent Desktops) to provide this flexibility. MID simply utilizes the Finder function mentioned earlier to "snap" the desktop at log off and save the appropriate file to the network so it can be delivered at the next log on. This process applies to PowerPC desktops as well (the Observatory is provided on the PowerPC-OS/2 Application Sampler). End Users should not care what type of OS/2 machine they log onto and with Pinnacle's technology they don't have to.

Summary

Whether you are interested in security or centralized management and delivery of OS/2 desktops, the technology available through Pinnacle can save a great deal of heartache and headaches.

Pinnacle Technology, Inc. was founded in 1992 to bring four key elements to OS/2: 1) Centralized Management; 2) Security; 3) user-proof; and 4) bandwidth sensitivity. Pinnacle's unique means of efficiently delivering desktops (patent pending) is used on over 100,000 OS/2 workstations worldwide. Current products include The Desktop Observatory V4 (centralized desktop management and security), The Desktop Commander (centralized desktop management), and Kid Proof/2 (for stand-alone machines). They can be reached at (800)-525-1650, (317)-279-5157, www.pinnacletech.com, or ehenning@pinnacletech.com.

Eric Osmann was a member of OS/2 Workplace Shell development team at IBM and left in late 1995 to lead development at Pinnacle Technology, Inc. He resides with his family in Colorado Springs and can be reached through electronic mail at helpdesk@pinnacletech.com.

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New Servers, Fixes, and Peeks at the Future

BY ALEXANDER ANTONIADES



OS/2 Warp Server released

IBM has just released some information on the update to OS/2 LAN Server, called OS/2 Warp Server. This information includes the pricing, the packaging options, and the release date, February 26, 1996. (It should be available when you read this column.) IBM specified that OS/2 Warp Server will be available as three separate packages.

The first package, OS/2 Warp Server, is priced at \$629. For that price you get the basic server software, which includes OS/2 and one client license for administration.

The second version of OS/2 Warp Server is a packaging option called OS/2 Warp Server First Step, which will be an introductory version of the base server package, with 10 additional user licenses. This version, which is intended as an introductory version for small networks, will sell for \$829.

The final package, OS/2 Warp Server Advanced, starts at \$1,299. This version is designed for networks with users ranging from 120 to 1,000. A feature to note is a version of HPFS386 that can specify a limit for an individuals' network drive space. Also new is built-in fault tolerance, including mirroring and duplexing. This version has one license for administration.

All versions of OS/2 Warp Server include a number of features and utilities that are part of the base package. These utilities

include a Netware migration utility, a new version of IBM's Safe 'n Sound backup program, the Ask PSP online troubleshooting help program, and a mobile file service for synchronizing disconnected users. Protocols supported by OS/2 Warp Server include DHCP, IBM's DDNS (see "Network Connection," OS/2 Magazine, March 1995, p. 76 for more information), SNMP, and DMI. Also notable in this new version are advanced print-handling capabilities, which can handle very large print jobs and interface intelligently with postscript printers.

OS/2 Warp Server includes client support for OS/2, DOS, Windows 3.1/95/NT, and UNIX. The only major platform not included, Macintosh, has client support available as a separate add-on kit.

In addition to the new client software, IBM is introducing a new licensing model for OS/2 Warp Server. The new model calls for licenses to be sold by the total number of unique login names, not by the concurrent users. So, three people who use the same PC, but have different logins, count as three users; while three users who have the same PC, but use one login, count as one user. Of course, for three users to login to three different PCs, will still require three separate licenses.

Each of these client licenses cost \$49. Upgrade pricing from LAN Server licenses were not available at press time.

FixPak 16 nay, 17 yea

IBM, in its usual manner, quietly released Fixpak 16 for OS/2, only to pull it from public availability and rework it for re-release as Fixpak 17. Fixpak 16 did not work well with a number of applications and appeared not to be as thoroughly tested as previous public FixPaks. Given that all of the official OS/2 FixPaks have generally been stable, I thought this incident was a good opportunity to talk to someone at IBM about what happened with 16 and what's happening with OS/2 FixPaks in general.

FixPak is a term IBM uses for patches to their products. They are usually just a collection of bug fixes, but can occasionally contain new functionality. The FixPaks that apply to OS/2 are broken down into three dif-

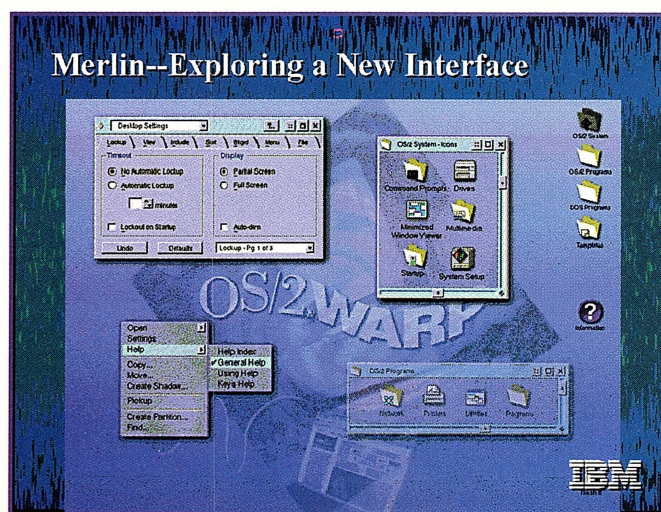


Figure 1: This screenshot, was leaked on to the Internet and shown to the press at Fall COMDEX 1995 to give an idea of what the next release of OS/2, code named Merlin, might look like. While we are publishing this picture to show what was shown to us by IBM, we can't be sure this will be what Merlin will actually look like when it's released.

ferent categories of products: The OS/2 Warp family (OS/2 Warp, with and without Windows, and OS/2 Warp Connect), OS/2 2.x (patches for OS/2 2.11), and OS/2 SMP.

Currently, four public FixPaks have been released for OS/2 Warp; their numbers are 5, 10, 16, and 17. As the gaps in the numbers indicate, there are internal FixPaks, which are never publicly released, but do figure into the numbering scheme.

According to Leo Annab, IBM FixPak Guru, the FixPak code is continuously being updated and, internally, new FixPaks can be completed as fast as twice a month. A fixed number of APARs (Authorized Program Analysis Report, IBM-speak for bugs) or a strict schedule for creating new FixPaks doesn't exist. Instead, they are pieced together on a fix-by-fix basis and then released to solve specific problems for major customers.

The goal is to release one public FixPak each quarter. Public FixPaks are only released once a quarter, due to the extensive testing resources required, and are only available to the FixPak team once every couple of months.

While all of the FixPaks for OS/2 Warp have so far been cumulative, meaning you can just install the latest FixPak over any copy of OS/2 Warp, that could change in the next couple of months. IBM will more than likely "sync up" with FixPak 17. So, you will need one prerequisite FixPak installed in order to apply any new fixes.

FixPaks have traditionally included little or no new functionality, but 17 is a definite exception. FixPak 17 includes underlying code, which will support DAX (the 32-bit Windows-like APIs to aid in the porting of Windows 95 applications), OpenDoc, and Security. FixPak 17 also contains the work around for OS/2's system input queue limitation (see this month's "Tips and Tricks" Tip 227, "The System Input Queue," p. 19). While IBM couldn't explain all the problems with FixPak 16, all of this new code was doubtlessly a contributing factor.

Another problem, which has arisen over the past year, has been leaks of the internal FixPaks to public download areas, such as *hobbes.nmsu.edu*. These

Getting the FixPak

You can download the latest FixPak from the following official IBM locations:

CompuServe: The OS/2 Support Forum *GO OS2SUPPO*.

IBM OS/2 BBS: the Software Download Library.

Prodigy: the OS2CLUB in the Download Library, IBM Files, Fixes area.

IBM Personal Computer Co.: BBS in Raleigh, NC: download fixes from the public area. You can access this BBS at (919) 517-0001.

On the Internet:

FTP to [ftp.software.ibm.com](ftp://ftp.software.ibm.com) (IP Address 198.17.57.67) /*ps/products/os2/fixes*

World Wide Web (WWW) access via:

IBM Software Manufacturing Solutions: <ftp://service.boulder.ibm.com>

The full path is: <ftp://service.boulder.ibm.com/ps/products/os2/>

FixPaks are also available on two of IBM's CD-ROM subscription services.

Developer's Connection: call (800) 633-8266 and choose 1 or see the Web page at <http://www.austin.ibm.com/developer/programs/DevCon/OS2/dcOS2.html>

Technical Connection: (800) 992-4777 and choose 1, 3, 4, or check out the Web page at <http://www.europe.ibm.com/getdoc/psmemea/technical/teccon.html>

internal FixPaks are not supported by IBM and aren't thoroughly tested, therefore, they might be harmful to your system.

How can you be sure that a FixPak is official? One way is to check out the first *readme* file. It has a *.rm1* extension, which lists the terms of usage. If it says the FixPak is only intended for a controlled distribution, then it's probably not official. Another way to check, is to download a file called *psprod.txt* from an official IBM support area. This file indexes products with the currently supported level.

As this issue goes to press, IBM is releasing FixPak 17, along with something called the Warp Update kit. This group of fixes contains the following components: WARPDAX (IBM Developer API Extensions for OS/2), WARPSES (IBM OS/2 Security Enabling Services), XR_W017 (OS/2 Warp FixPak 17), and XR_WP16 (OS/2 Warp Printer FixPak, necessary for WARPDAX to print). While FixPak 17 should be worthwhile for general users trying to cure their system hangs, the other components should only be useful for developers building programs based on these upcoming OS/2 features.

IBM: OS/2=12 Million

IBM says they sold one million licenses in December 1995, raising the total

number of OS/2 Warp licenses to six million and overall OS/2 purchases to more than 12 million. Whatever the driving force behind the large number is, it wasn't an order from the U.S. Navy for a reported 400,000 licenses, which according to IBM does not figure into this statistic.

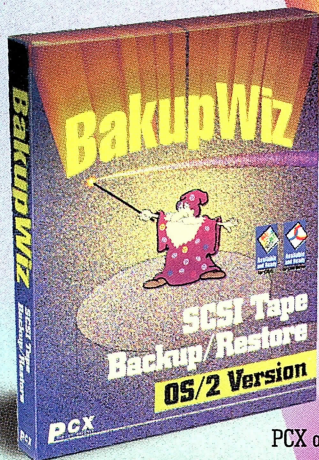
IBM consent decree lifted

A federal court order finally ended the 40-year-old consent decree between IBM and the U.S. Government. The order, which was issued January 17, 1996 by Judge Allan G. Schwartz of the U.S. District Court for the Southern District of New York, ends the decree in its entirety for all IBM products, except for the S/390 and AS/400 family of products.

The consent decree dated back to 1956, when IBM blocked almost all other companies out of the computer industry through a number of anti-competitive business practices.

While the restrictions have been removed, it's still too early to say what effect it will have on a company operating under these conditions for the past four decades. One of the first impacts of this decision is expected to be IBM's new found freedom to enforce an arsenal of patents, which were unenforceable while the consent decree was in effect.

OS/2



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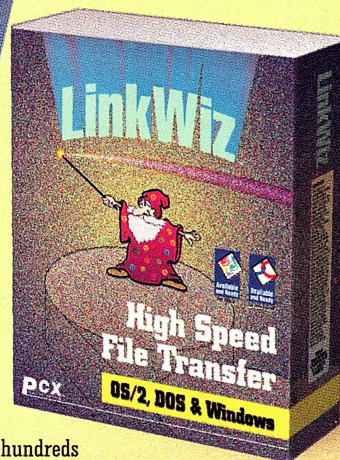
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Just Announced

ColorWorks 2.0

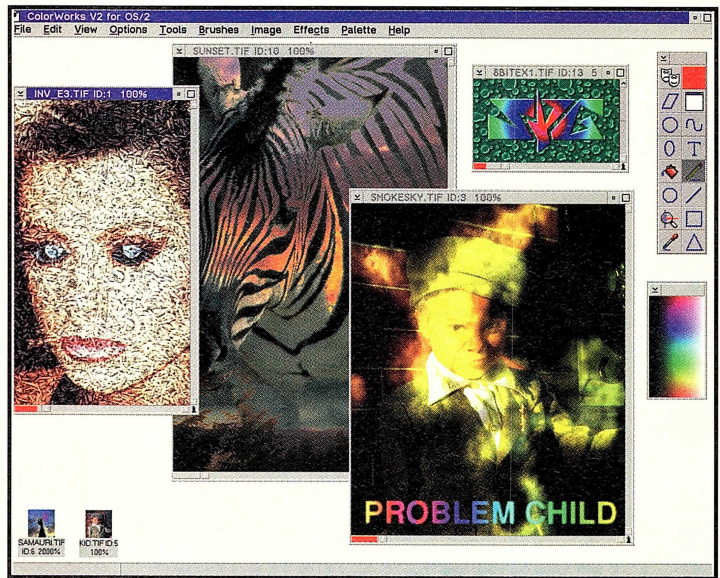
New version of OS/2
image manipulator

SPG releases the 2.0 version of its multiple-processor-enabled graphics paint and image processing program. New in this version of ColorWorks are professional CMYK separation capabilities that include tonal compression, more special effects, support for pressure-sensitive input devices, enhanced printing with the ability to print composite images, color separations, overlay proofs, and 32-bit plug-in interfaces for third-party developers. Also in this new release is additional file-format support including PhotoCD, CMYK TIFF, and CMYK EPS. The full version of the program comes with a 580-page hard-cover color book, and all versions of the program include a 25MB online manual on the program CD-ROM.

Colorworks pricing is: \$349 for the full ColorWorks 2.0 package, \$249 for the ColorWorks 2.0 CD-ROM-only package (no printed manual), \$169 to upgrade from ColorWorks 1.0 to 2.0, \$99 to upgrade from ColorWorks 1.0 to the 2.0 CD-ROM only version, and \$149 for ColorWorks 1.0.

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JBA International releases its complete application development environment for creating stand-alone and client/server desktops as well as enterprise applications. Generated applications can run on OS/2, Windows, AS/400, UNIX, and now IBM Mainframes. New support for the latest C++ compilers from IBM, Borland, and Watcom, as well as Lotus Notes databases, is included. Other features are image control, distributed object messaging, enhanced teamwork development, and enhanced three-dimensional graph control. Currently in beta is the Enterprise developers pack (Guidelines 3.4 release), which will include support for the IBM MQSeries, IBM CICS, IBM DRDA, and IBM APPC/LU6.2.

Pricing for Guideline 3.3 starts at \$595 for the OS/2 desktop editions.

JBA International, (609) 231-9400 ext. 3058, (800) 522-4685 ext. 3058, or see its Web page at <http://www.jba.co.uk>. Call for a free CD-ROM evaluation kit.

READER SERVICE NO. 101

Check Plus 2.1

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financial management

Computer Interface Corp. announces the release of its financial management program for OS/2. Check Plus provides support for checking and cash accounts, investments, credit cards, loans, and inventory. New in the 2.1 release are better data-viewing tools, including on-screen viewing of predefined and custom reports, as well as several options for sorting transactions and better deposit handling, which supports both single- and multiple-item de-

posits. The import filters for Quicken and Managing Your Money have also been improved, along with ASCII import/export.

The price of Check Plus is \$89.

Computer Interface Corp., (800) 992-3428, (508) 651-8111, or e-mail 71151.1526@compuserve.com.

READER SERVICE NO. 102

TouchMate

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MicroTouch Systems announces a new hardware product that can make any monitor touch sensitive. The primary part of TouchMate fits underneath any conventional monitor and has sensors fastened around the edges, leaving the screen completely unaffected. This new hardware uses the same OS/2 drivers

as MicroTouch's other touch screens and also includes support for other operability systems such as, Windows 3.1, Windows 95, Windows NT, and DOS.

TouchMate is available for \$545 direct from MicroTouch.

MicroTouch Systems, (800) 642-7686 or (508) 659-9000.

READER SERVICE NO. 103

Object Engineering Workbench for Java

New Java development tool

Terasoft Technology Corp. introduces a new version of its productivity tool kit for Java on OS/2. Object Engineering Workbench for Java provides a Graphical User Interface to help build Java applets that can be run on any Java-supported platform.

Pricing for the Object Engineering Workbench for Java was unavailable at press time.

Terasoft Technology Corp., (508) 634-8400, fax (508) 634-8236, e-mail 73602.2737@compuserve.com, or see its Web page at <http://www.isg.de/>.

READER SERVICE NO. 104

Blowfish OS/2 Volume II CD-ROM

Two CD-ROMs worth of OS/2 programs

Pacific HiTech announces its two CD-ROM collection of shareware for OS/2. Blowfish OS/2 Volume II contains over one gigabyte of uncompressed files that include file managers, editors, Workplace Shell utilities, programming utilities, and online newsletters. This collection has a custom presentation manager interface for managing the programs, many of which can run off the CD-ROM.

Blowfish OS/2 Volume II is available for \$29.95.

Pacific HiTech, (801) 261-1024, fax (801) 261-0310, e-mail info@pht.com, or see its Web site at <http://www.pht.com>.

READER SERVICE NO. 105

Fault-Expert for OS/2 1.0

Diagnose client/server ills

Compuware releases the first PC implementation of its tool for diagnosing OS/2 application and CICS transaction errors in a client/server

environment. Fault-Expert for OS/2 can immediately detect and capture all relevant information about failed applications and transactions. Notification of these errors can be transferred via electronic mail (VIM, MAPI, or MHS), pager, or to various help desk software packages. The product itself is broken down into two modules: The Agent, which resides on the workstation, and the Workbench, which manages the Agent's output and diagnoses problem reports.

Fault Expert is priced at \$2,000 for the Workbench portion of the product, which comes with one Agent license, and \$165 for each Agent licensee. AIX and NT versions are due later this year.

Just Announced OS/2 Internet Sites

OS/2 Warp Weekly and Monthly Newsletters

A great source of information directly from the source. Includes stories, feature articles, interviews, fun stuff, and much more. <http://www.austin.ibm.com/psinfo/newsletters.html>

IBM U.S. Education and Training

A comprehensive guide to U.S. Education and Training, including courses on OS/2, OS/2 Warp, OpenDoc and Object Technology. <http://www.training.ibm.com/usedu>

Club OpenDoc

Debating at COMDEX Fall '95, Club OpenDoc has well over 1,000 members. This site has the OpenDoc for OS/2 SDK. <http://www.software.ibm.com/clubopendoc/>

Team OS/2 Help Desk Web Site

Lori Martin's totally cool web site, with lots of OS/2 information and home to the Team OS/2 *Help* mailing list. http://www.execpc.com/~lam/team_help.html

UPDATED:

IBM's Software Homepage has moved, as well as all sites underneath it.

The new URL is <http://www.software.ibm.com/>

You can reach IBM's Solution Developer Operations at <http://www.developer.ibm.com>

SDO has moved ALL its information under this one umbrella site. The former sites beginning with www.austin.ibm.com/developer will work only for a short time and may not be functional at all by the time you read this. Also note that many of their services will be available only to members.

Team OS/2 Online: <http://www.teamos2.org/>

Although this is basically the same URL as before, the *ibm/* portion of the address has been removed. It's now strictly a volunteer site and has moved to a new server.

(Information courtesy of Vicci Conway.)

Just Announced

OS/2 APPLICATIONS TOP 15 LIST—JANUARY 1995

This Month's Rank	Last Month's Rank	Product	Company
1	1	Object Desktop	Stardock Systems
2	2	Partition Magic Personal Edition	PowerQuest
3	9	FaxWorks Pro 2.0 Upgrade	Global Village
4	5	BackMaster 2.0	MSR Development
5	4	Hobbes CDRom Archive	Walnut Creek
6	3	Describe Voyager CD	Describe
7	-	HyperAccess 6.0	Hilgraeve
8	13	Unimaint 4.0	SoftTouch Systems
9	6	Galactic Civilizations 2.0	Stardock Systems
10	10	Avarice Preview CD	Stardock Systems
11	11	IBM AntiVirus	IBM
12	7	GammaTech Utilities 3.0	SoftTouch Systems
13	12	BackAgain/2 (OS/2 Prof. Edition)	Computer Data Strategies
14	-	Sytos Premium 2.1	Arcada Software
15	14	Impos2	Compart GmbH

Since OS/2 Warp and OS/2 Warp Connect are consistently ranked as our top-selling products, and sales of additional licenses can sometimes skew results, this list has been modified to highlight only the top-selling OS/2 applications. (Best-seller information courtesy of Indelible Blue.)

Compuware, (810) 737-7560, or see its Web page at <http://www.compuware.com>.

READER SERVICE NO. 106

WebBook 1.0

Web page organizer

Sine Qua Non announces the release of a Web page manager for IBM's Web Explorer browser. WebBook allows Web pages to be organized into categories, as well as four levels of sub-categories using the book metaphor. This program can control the Web Explorer and includes the ability to stop a web page from loading and to jump to another link with a single click. WebBook is available for \$10 direct from the developer or as shareware.

Sine Qua Non, (815) 372-2771, fax (815) 372-2773, e-mail webbook@sinequanon.com, or see its Web page at <http://www.sinequanon.com/>.

READER SERVICE NO. 107

OS/2

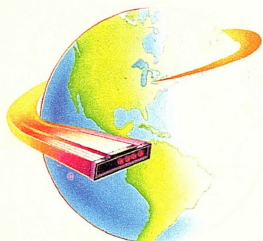
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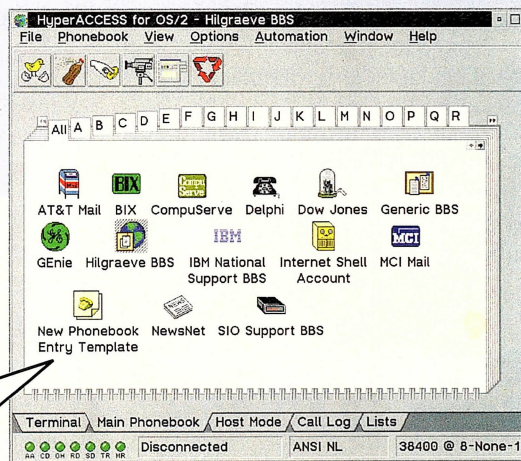
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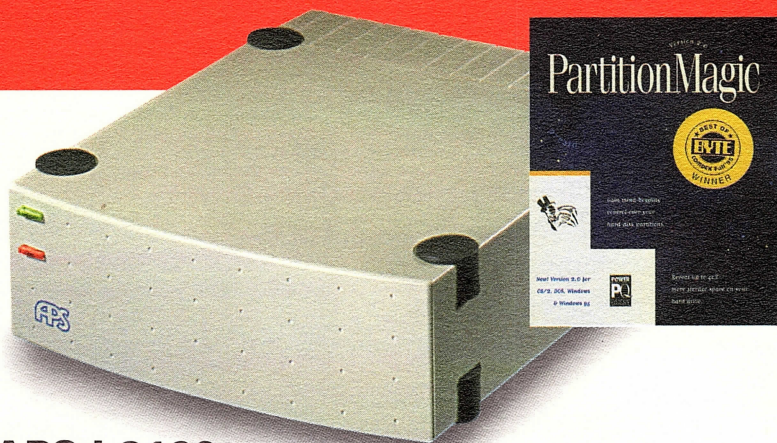
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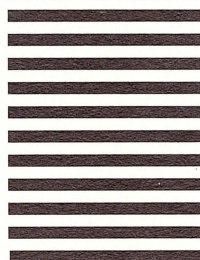
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Caches and Fixes

BY DAVID REICH

TIP 223:

SWITCHING FORMATS

Q: I recently converted my 503MB FAT drive to HPFS, using the convert utility in Partition Magic. While the conversion went fine, I was dismayed at the drop in disk performance. One third-party utility suggested that my disk access and program load performance had dropped significantly. I have 16MB RAM and have tuned the *config.sys* file to the best of my abilities.

Now, I realize that the Partition Magic conversion to HPFS was a type of quick format. Could I benefit by backing up my system, formatting the partition to HPFS with the OS/2 Warp installation disks, and then restoring? Would the restore place my system and boot files in the right locations?

A: Actually, the Partition Magic conversion did its work just fine and has nothing to do with the drop in performance. The answer is a bit involved.

Essentially, there is not much you can do. What seems to have happened is that your executable files (*.dlls* and *.exes*) are not page aligned on the disk (in the cache, more specifically), and so one or more extra input/output operation needs to be performed to get code loaded from the disk. You've no control on this alignment. IBM is working on improving HPFS and FAT, since the situation is the same on both, but you just

got lucky on FAT in the alignments.

You might get lucky with alignments by backing up and reformatting; you might also just wind up the same way. It won't hurt anything if you do. In fact, if you went back to FAT, you might not get to the same point you were at before switching over. Basically, it's random as to how things get placed on the disk relative to the alignment of code pages when they need to be loaded. It's this randomness that needs to be changed in the system, either to be user configurable or automatic as to its alignment of executable files.

TIP 224:

ENOUGH SWAPPING

Q: I'd like to place my swap file on *d:*, which is an HPFS drive. I have OS/2 Warp installed on *e:*. I changed the *swappath=e:\os2\system 2048 20000 to d:*, but on boot up I get a message that states that *d:* can't be used. Is there a fix that gets OS/2 Warp using *d:* for a swap drive?

A: I can think of no reason as to why *d:* can't be used as a swap drive. The fact that it's HPFS as opposed to FAT is of no matter. The problem might be related to the parameters you are using in the *SWAPPATH* statement. The two numbers you specified are the minfree and initial size, respectively.

Minfree says that the swap file can't be created in or grow into the last *x* K bytes (in your example, 2,048K or 2MBs) of free space on the swap drive. The initial size is just that—the initial size of the

swap file at boot time. In your example, you need more than 22MBs of free space on *d:* when you boot. Otherwise, when you try to start the system you'll already be eating into the minfree, because you specified an initial size of 20MB.

The other possibility, though more obvious, is that *d:* has to be a formatted drive, otherwise the swap file can't be written.

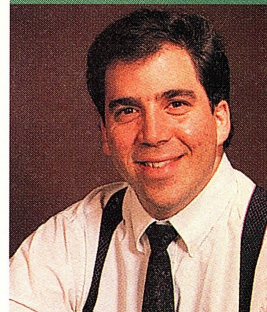
TIP 225:

MULTIPLE LAUNCH PADS

Q: I'm running OS/2 Warp on a laptop and would like to have different Launch Pads for docked and undocked operations. Is it possible for me to have more than one Launch Pad, with each one having its own settings and contents?

A: As you might have discovered, the Create Another menu item doesn't exist on the Launch Pad's Context menu, nor is there a Launch Pad template in the *Templates* folder. There is no way, currently built into OS/2 Warp, to make a second instance of the Launch Pad, so we have to create a program.

The Launch Pad you see on the desktop is an instance of the *WPLaunchPad* class. This is an Abstract class, with its persistent information (the information stored across reboots) stored in the *.ini* files. Each instance of an object class has its own set of persistent data. What you need to do is create a completely new instance of the *WPLaunchPad*



Listing 1: Create another LaunchPad using REXXUTIL.

```
/* NLAUNCH.CMD: Sample code using REXXUTIL's SysCreateObject function */
/* to create a new instance of a Launch Pad */
/* Load the REXXUTIL functions first */
call rxfuncadd sysloadfuncs, rexxutil, sysloadfuncs
call sysloadfuncs
/* Now set up the parameters to be used in creating the object */
/* instance. Then we will make the basic call of:
/* result = SysCreateObject(classname, title, location)
classname='WPLaunchPad' /* Use the WPLaunchPad class
title='My New Launch Pad' /* Whatever title you like
location='<WP_DESKTOP>' /* Place it on the desktop
/* Now call the REXXUTIL function to open the object.
call SysCreateObject classname, title, location
Return
```

object class. To accomplish this action, you can use the REXX programming interfaces for the Workplace Shell.

Quite simply, you will use **SysCreateObject**, specifying the **WPLaunchPad** class, with a name you choose for the new Launch Pad and a location. The program in Listing 1 shows this change and is self explanatory. You can type in this program exactly as shown in the Listing.

TIP 226:

REPLACING DLLS

Q: I'm trying to replace several old DLLs with one new one. The complication is that I have objects registered to these DLLs. This locks the DLLs; therefore, I'm jumping through hoops trying to get something working.

Does it make sense to register a DLL that does nothing, even though it still has the requisite functions to make it register, and then replace it later with a DLL that actually does all of the "right stuff"? Also, who am I doing battle with in this fight? Are all these DLLs locked by the Workplace Shell, by OS/2, or by a combination of the two?

A: Since you have objects registered by these DLLs, you know you're working with the Workplace Shell's reference of these DLLs and your desire to replace them. Actually, it's not the registration of the objects so much as it's the instantiation of the classes residing in these DLLs. Because you have registered a class and instantiated that class, the shell is referencing the DLL.

The reason the system won't let you delete, replace, or rename it is because an

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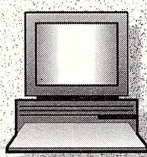
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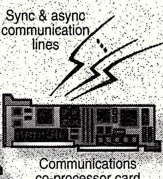
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Tips & Tricks

active process (the shell) has the DLLs referenced. You must terminate the process before replacing the DLLs. If you reboot, but still have the class instantiated (objects belonging to the class are in some open folder or other object), the shell again references the DLL and the system locks it. You must replace the DLL before the shell touches it.

You can do this in several ways. You could use the <Alt+F1> method of interrupting the boot sequence to get to a command prompt and from there replace your DLLs. Another alternative is to use the RUNWORKPLACE statement in *config.sys* to have your system always boot to a single-windowed command prompt. Although not recommended for production systems (this method is best used on test or development systems, because you will always boot to the command prompt and not the shell), the system will be up so you can replace the DLLs, but it won't boot to the shell automatically.

By specifying *c:\os2\cmd.exe* (or whatever your boot drive is) for the RUNWORKPLACE statement in *con-*

fig.sys, you are telling the system not to start the *pmshell.exe* process as the primary shell, but to start *cmd.exe*, the command interpreter. From here, you can copy files and perform most system operations. You won't have the benefit of the shell at that point, and you have only limited program starting and switching ability. However, you can use this command prompt to replace the DLL files, then start the shell by typing "pmshell".

This method is most often used by shell object class developers, because you can register object classes, see the results, make changes and rebuild the DLLs, terminate the shell with <Ctrl+Break> or <Ctrl+C>, replace the DLLs, and restart the shell by typing "pmshell" again. Eventually, you'll run into *.ini* file problems, because you are bringing the shell up and down without flushing *.ini* files and will most likely need to change the format of data stored in the *.ini* files for your object class(es) during the course of development.

Another option is to use a *.cmd* file

and, before the system is fully initialized, place a RUN or CALL statement in *config.sys* to run your *.cmd* file. This *.cmd* file will replace the DLLs and delete the RUN or CALL line from *config.sys*, making sure it doesn't run each time the system is booted.

As you can see, you have several options in replacing your DLLs, which become the system's DLLs once you register them with the shell. These options are a representative sampling of how to accomplish what you're looking for in a variety of circumstances.

TIP 227:

THE SYSTEM INPUT QUEUE

Q: I've been reading about changes to the System Input Queue design of OS/2. What is the system queue? Why do I care? I'd like to know the details.



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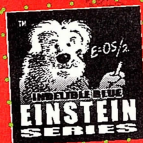
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A: The System Input Queue is an element of the user input design of OS/2. As I'm sure you can surmise, user input comes into the system from either the mouse or keyboard (or an alternate device such as a touch screen). This input has to go someplace. This is where we find the system queue.

The System Input Queue is a part of the Presentation Manager, the graphical and windowing subsystem of OS/2. The system queue takes all user input from mouse- and keyboard-like devices (except for some full-screen session work) and funnels it through this system queue. All of these events are turned into messages, which are understandable by the Presentation Manager subsystems, as well as all graphical OS/2 applications. These messages are how OS/2 applications work and communicate.

The system queue's design can be a problem when applications do not respond to their messages in a timely way. This response is totally up to the application developers, and some don't know, or don't follow, the one-tenth-of-a-second rule. This rule tells the application to respond to user input messages in less than one tenth of a second. If long tasks need to be performed, they must be done on separate threads. Problems arise if applications don't respond quickly, because messages will back up in the system queue.

The net result is that you, the user, notice that your system appears to be hanging. You might see painting and window updates taking place, but you can't interact with the system. This eventuality is because some application is not responding and therefore is causing the system queue to back up.

OS/2 has had some level of recovery built into it in the form of a bad application watcher. You might have noticed that if your system gets into this "hung" state, you can press <Ctrl+Esc> a few times and wait to see if you get a window that allows you to terminate the offending application. This window, though, doesn't always appear, and in some cases, it can't terminate the application. Its presence was an attempt at a "last ditch" effort to regain control of the system.

Recently, in FixPak 17, IBM has added code to alleviate this system queue problem. This code will also be in

future versions of OS/2. The new code determines if an application is not responding to messages (it's "bad") and then refuses to send any more to it until it starts responding again. The functioning is very straightforward. I will give you a *config.sys* setting that will modify its behavior, if you would like to use it.

With the new code in place (FixPak 17 or higher, or later versions of OS/2), the SIQ-Fix, as it has come to be known, is built into the system. In the FixPak levels, it's turned off by default, and you'll have to take action to enable it. First, let's look at how it works.

The SIQ-Fix is activated only when two actions take place. First, the application that has the input focus (the application that is currently active and where the system is sending user input messages) is not grabbing messages from its queue. In other words, it is violating the one-tenth-of-a-second rule. Second, while the application that has the focus is doing something other than responding to or waiting for another message, the user attempts to change focus. For example, this can be <Ctrl+Esc>, <Alt+Esc>, or a mouse click on another application.

The focus change policy in the system is important. The system gives the application that is losing focus (the one currently with the focus, but the user wants to change the focus to another application) a chance to take some action and sends it a message. In general, the system taps the focus application and says, "I'm taking away focus. Okay?" The focused application, as a result of that message, can take some action but then needs to respond that it's okay to remove focus and give it to another. If that response does not come back, the application is bad. It's at this point, that <Ctrl+Esc> might be able to trigger the older bad-application dialog.

The SIQ-Fix now detects the application currently with the focus as bad and mark its queue as such. It then takes the focus, without permission (because who knows how long it will take for the bad application to wake up) and continues. This action allows you to continue to use your system. If the bad application does start responding to messages again, the new SIQ-Fix code can mark the application's queue as good again. The net result is that the

user can change focus and continue to use the system, even if an application doesn't respond to messages.

The way to turn this code on in your system is to add a line in *config.sys* and reboot. The syntax for this line is:

```
SET PM_ASYNC_FOCUS_CHANGE=ON/OFF x
```

Because ON or OFF turns it on or off, and the default is off, you should add this line with ON specified, to turn it on.

x is a number that represents a time-out in milliseconds. The default is 2,000 milliseconds (two seconds). The time-out determines how long to wait before a focus change message is not responded to and the application is marked as bad. So, to turn it on and leave the default time-out, add:

```
SET PM_ASYNC_FOCUS_CHANGE=ON
```

to *config.sys* and reboot. To turn it on and change the time-out, add:

```
SET PM_ASYNC_FOCUS_CHANGE=ON 5000
```

which changes the time-out to five seconds. Don't ever change it to less than 500 (one half of a second).

You might want to try this out with all of your applications before leaving it on indefinitely, because some applications that don't strictly follow the one-tenth-of-a-second rule, might take a little longer to respond than they should. For example, if you set 500 milliseconds, but some applications take 750 (three fourths of a second), the system will flag them as bad too quickly. So you might have to fine tune the time-out until applications get even better about their response times.

Now, you probably have more knowledge about the system queue than you ever thought you would, or ever thought you wanted. 

David Reich has been with the OS/2 development team since 1987. David is a contributing editor and has written numerous articles on OS/2 and is the author of Designing High-Performance OS/2 Warp Applications published by John Wiley and Sons. Questions can be addressed to David via CompuServe at 76711,632 and Internet at speedracer@vnet.ibm.com.

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12/12/94

The reviewers at *InfoWorld* learned that for quickly building portable C++ GUI applications, **nothing** beats the zApp

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twenty thousand words were written, and twenty-two full pages ran in *InfoWorld*. The results were conclusive: In every review, the zApp Developer's Suite won, by over a full point on a ten point scale over its next closest competitor.

For a complimentary reprint of this entire review, please call (800) 487-3217 and get a glimpse of what everyone is talking about.



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Lotus Notes from the Ground Up

focus on the version currently deployed in most businesses, Notes Release 3.3; we'll discuss Notes Release 4 in a future article.

What is Notes

Notes could be described as a container for information and as a dispenser for that information. What kind of information? The answer to that question sounds as if it comes from a salesperson: "What kind of information would you like it to hold? Yes, it can do that."

Notes works best for unstructured, nonrelational kinds of data. There are Notes solutions for relational data requirements, too, but Notes databases are especially appropriate for large amounts of text and mixed data that users want to access in a flexible format.

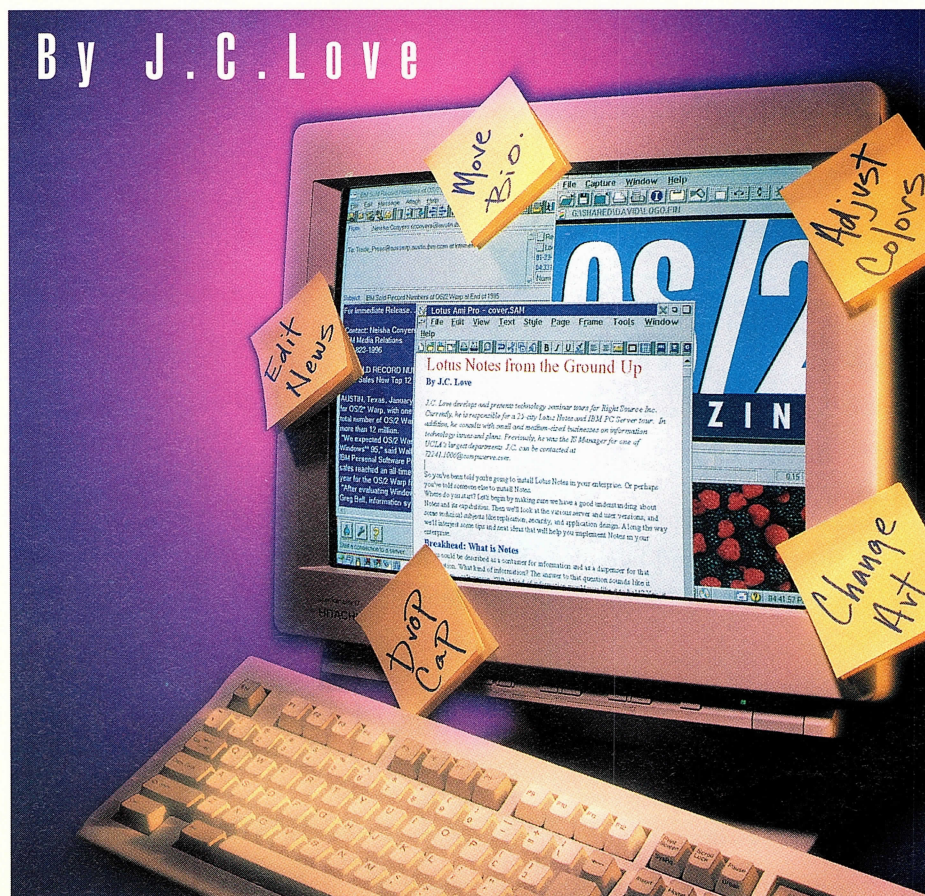
Data required in a transaction-processing environment (where many transactions occur with structured data over a short time) is usually best stored in a relational database environment, such as the DB2 family, Oracle, Sybase, or one of the other

Installing and configuring

Lotus Notes 3.3 or later

So you've been told that Lotus Notes is being installed at your enterprise. Or perhaps you've told someone to install Notes. Where do you start? Let's begin by making sure we have a good understanding about Notes and its capabilities. Then we'll look at the various server and user versions, as well as some technical subjects like replication, security, and application design. Today we'll

By J.C. Love



SQL database systems. However, Notes can gain access to that data should a Notes application require it.

Another way to describe Notes is by what you can do with it. For example, Notes contains its own e-mail system. Notes Mail can be disabled if you choose to retain your existing enterprise's mail for all users, but most Notes implementations use Notes Mail for Notes users, while retaining other mail systems for other users, connecting the two (or more) mail systems through mail gateways.

Not only is a Notes Mail gateway available to interface to other mail systems, but there are also gateways for faxes, pagers, and even an optional product called Phone Notes, which can read a user's mail to the user over the phone.

The Discussion Database is one often-used Notes capability. They allow online, asynchronous meetings and brain-storming sessions. In most new Notes installations, Discussion Databases become the enterprise *ad hoc* conference rooms.

Document Databases typically hold reference information—the kind of documents that most of us put in our filing cabinets and can never find because we can't remember how we categorized them.

Notes allows us to keep documents always available to those who have been given access so all see the same version. Security, one of Notes' greatest strengths, makes sure that only those who should have access, do, and that only those who should be able to modify documents, are allowed this capability.

Applications are Notes' Ginzu knives. For most enterprises, Mail, Discussion Databases, and Document Databases are worth Notes' price. The very powerful application capabilities, as well as a unique rapid application development environment (Notes uses the term "design" for application development), quickly make believers out of most information systems (IS) folks. In fact, a study by International Data Corp. discovered Notes' RAD capabilities to be so good that the rapid development result becomes the application, and if it doesn't work out, it's cheaper to throw it away and start over than go

through the traditional respecification, redesign, recoding, and retesting processes.

Inside the database

The basis of Notes lies in its databases. Several different kinds of information serving different functions are retained in the databases. Let's take a look at them.

Data. Information is entered into Notes using forms, but the data itself is usually saved separately from the form. The data can be text (or rich text), numbers, or time. Multiple defining options are available for each data type.

Forms. You can think of a Notes form as being like a stencil. It allows you to enter data into a Notes database document, to modify data, and to view the data. Databases typically have several forms which allow different ways of entering, modifying, and viewing information. Notes forms are kept in their associated databases.

Views. A Notes view is a way of looking at a summary of the documents in a database. The view presentation is of rows, with each row representing either a specific document in the database or a heading that groups the following document rows. Notes databases usually have several views, allowing you to look at summaries of the documents in a database in alternative ways.

For example, you might have a database that holds customer information. Your views available for that database might include document summaries by customer name, state, telephone area code, industry classification, and so on.

You can keep different kinds of information in a single database and then use views to organize your "cuts" or looks at summaries of that data. Like forms, views are stored in the database for which they are used.

ACLs. Access Control Lists specify the Access Control Levels for individuals and groups for a database. Notes allows each database to have different security access by different users and groups of users.

Like forms and views, ACLs are stored in the databases they reference. Notes databases can be created using

database templates. A template is a database without data for a specific kind of use, but includes forms, views, and ACLs that are appropriate for the target use. You can create a new database without a template, but the couple of dozen templates available make rapid development of new uses and applications a cinch.

Notes Server

Notes runs on its server. This can be a little confusing, because Notes Server is its own network server. In fact, a NOS (Network Operating System) is not required to run Notes. For example, you can have a Notes network if you have the following:

- a local area network (LAN) consisting of just the cable plant (such as Ethernet or Token Ring)
- a NIC (Network Interface Card) in each workstation
- a server-class machine running Notes Server with a NIC
- the same protocol stack on each of the workstations and the Notes Server computer
- a desktop version of Notes running on each workstation.

Want to make it really easy? Use OS/2 Warp Connect. Just select one of the protocols (probably NetBIOS is correct) during installation of OS/2 Warp Connect for each machine. With a NIC connected in the same LAN, install Notes Server on one computer and a desktop version of Notes on each of the workstations, and *Voila!*

If you have a LAN, you almost certainly already have a NOS, which can be very useful in a Notes environment. Why? For one thing, you can install Notes for your users from your network file server. Most network managers find a network installation of user applications much more efficient than shuffling floppies for every workstation. Upgrades are more manageable, too.

Many Notes networks are set up so that users run their desktop Notes from a file server. However, some find that loading and execution of Notes is unacceptably slow when run from a file server. Network traffic may be so high that other LAN-based

Notes Application Design

If you've ever used the @ sign formulas in Lotus 1-2-3, you already know the toughest part of Notes application design. Besides designing views and forms, both simple processes in themselves, using formulas and multiple formulas called macros, is as complicated as the design process gets.

A number of sample applications are included with Notes, which makes it easy to get started. These are working, modifiable applications, not demos, and you may find that one or more will prove to be immediate solutions for your enterprise.

operations suffer in this type of configuration. You may want to give some consideration to trying this arrangement and check to see if you experience bandwidth problems. You can use a combination approach, too, with some workstations running from the file server and others from local hard-drive installations.

Almost certainly, you'll want to run Notes from its own server. Most Notes installations experience rapid acceleration of Notes usage as users discover the efficiencies of Notes' various capabilities.

Notes Server can run on a variety of platforms. It will run on OS/2, Windows NT, as an NLM on Novell's Netware (the NLM version requires that you buy a separate Netware license, if you want a dedicated Notes server), and on several types of UNIX, including IBM's AIX and SCO UNIX. A version of Notes Server that runs on Windows 3.1 is even available. You will, however, bring such a system to its knees with only a very few users—Windows just isn't very powerful or robust—but it's available. (Currently in beta and expected to be available the second quarter of 1996 is a version of Notes Server that runs on an FSIOP option board for the AS/400, allowing the use of that platform's hard drives.)

Notes user licenses

There are three versions of Notes 3.1 for users: Notes Express, Notes Desktop, and plain old Notes.

Lotus Notes Express is the least expensive and most restricted version of Notes for users. Notes Express users

can use databases based on several different database templates as well as Notes Mail. "Climbing on the Notes Express," by Brian Proffit (*OS/2 Magazine*, November 1995, p.24) details them. Notes Express can't use such databases if changes are made to the database structures, can't use additionally created views and forms for them, and will not run Notes applications.

Nevertheless, Notes Express is an economical way for many enterprises to move most or all "seats" in their network to Notes, taking advantage of Notes Mail and Notes' workgroup collaborative Discussion and Document Databases. Users with greater requirements, such as needing to use databases based on templates not available in Notes Express or to run Notes applications, can be upgraded to one of the more senior Notes user licenses.

One especially nice feature about OS/2 Warp Connect is that its Bonus-Pak includes Notes Express. This makes it especially easy for you to move your

entire enterprise to Notes and the robust 32-bit desktop operating system of choice at the same time. The IS Manager's tasks can be made relatively simple by using IBM's CID (Configuration, Installation, and Distribution) facility for OS/2 Warp installation and a network installation for users, requiring a higher-powered Notes license.

The **Lotus Notes Desktop** license allows the user to use any Notes database created with any template (or from a blank database structure) and to run any Notes application.

The most senior-level license for users, **Lotus Notes**, allows everything that the Lotus Notes Desktop license permits, and adds design and database modification capabilities. You'll need at least one, and possibly want several, full Notes licenses in your enterprise.

Remote Notes

Notes provides the same level of collaborative computing capabilities for those who travel as it does for office-

User Platforms

Notes for users can be hosted on a wide variety of platforms and desktop operating systems. They include:

OS/2 Warp: The Presentation Manager version of Notes is rock-solid. If you're used to some of the better implemented Workplace Shell applications that are available, you may find your fingers drumming your desk because of Notes' less than ideal use of threads. It's especially noticeable when you're connected to a Notes server via an asynchronous phone line. However, you'll treasure OS/2 Warp's multitasking ability, which lets you switch to another application while Notes does its thing. We find OS/2 Warp to be the premier target desktop for Notes. Eventually most Notes users become so dependent on it that they always keep Notes running and minimized. You may want to specify more than the suggested minimum RAM requirements for your users—in the case of OS/2 Warp, 16MB is a number that will work well for most users.

Windows 3.1: Lotus did a good job of creating a robust Windows application with Notes, even though Windows users are always in danger of another application bringing down Windows itself as well as all running applications. You'll want more than 8MB RAM for computers running Windows and Notes. You'll find that 12MB may do it, but 16MB will probably be worth the expense. If you have dual boot computers, follow the specific guidelines for successful installations. Check your Notes administrator's guide, section 2, for details.

Windows 95: At press time, you'll be running the standard Windows user software for Windows 95 users. A realistic minimum for this operating system is 16MB.

Windows NT: The same information as for Windows 95 applies, although you may want more than 16MB RAM.

Macintosh: The Mac has its own user software, which installs easily and works very nicely. The user interface is similar to the OS/2 and Windows versions—so much that you'll need only one training class for all platforms. Macintosh memory requirements depend on what you're using it for in addition to Notes, but most experiences are that you'll not need to upgrade them.

UNIX: Besides acting as a server, UNIX installations can use Notes for the desktop clients. Only the full-version license of Notes is available for UNIX workstations, and they must be configured to run X Windows in order to support the Notes' graphical user interface. Memory requirements are dependent upon the number of workstations running Notes from the server as well as other running applications, if any.

bound users. If you've ever been a road warrior, you already understand the problems of staying connected to your organization. Remote users with the proper licenses and appropriate security permissions can write and respond to mail, use Notes Discussion and Document Databases, and execute Notes applications.

It's easy to set up Notes servers so that remote users can connect to them. Many users prefer to maintain replicas of their mail and other Notes databases on their notebook computers. Using a Notes process called replication, database replicas from users' notebooks are updated from time to time with changes made to the server copy, and vice versa.

Replication

Replication is a process that synchronizes replicas of Notes databases residing on different servers or on a server and a workstation. The replication engine checks the database being replicated document by document. It adds new documents, found in one replica, to the other replica. If a document has been deleted from one replica, it is deleted from the other. Documents that have been modified on one replica are changed on the other.

If a document has been changed on each replica, both are replicated, and the version of the document with the most changes since the previous replication is declared the "winner" (if there is a tie, the document modified most recently wins). The other revised document version becomes a response document and is labeled with a code that means **Replication or Save Conflict**. The conflict can then be resolved by the manager of the database.

Replication is one of the most intricate features of Notes. Fortunately, all we have to know about it is how to schedule the replication process. Notes' administrator's documentation covers the subject thoroughly.

Notes security

Lotus Notes offers five levels of data and access security. The first level of Notes' security is **Certification**. Your Notes ID is an encrypted file that begins its life with the name, *user.id*. This file contains your user name, password, and the certificates that allow you to work with Notes servers and databases.

Notes Server Installation Tips and Tricks

Tip: Secure your server. Your Notes server is no different than a filing cabinet that contains sensitive information. Make sure your Notes server is locked in an air-conditioned server room or equipment closet unless you are using a UNIX server (and even then locking it up is not a bad idea). If that's impossible, use the server without a mouse and keep the keyboard locked.

You can and should use the **SET SECURE** command, which restricts the actions that can be taken at the server console unless the proper password is entered.

Trick: Add NOTES SERVER to the *startup.cmd* file. This will enable automatic starting of Notes Server when you boot your server. One of Notes' options is to password-protect the server's ID. You will not want to use it, though, because you wouldn't be able to have the server automatically restart without entering the password at the server if it is unexpectedly shut down by a power outage.

Tip: Use a dedicated server. False economies abound, and installing Notes server on an existing network file server is an excellent example. It's easy to think that you're going to save dollars by using existing equipment, but if you do you'll find that you'll quickly run out of disk space and your Notes performance will be less than desirable. You'll eventually need a dedicated Notes server—experience dictates that Notes applications and uses will quickly exceed your expectations—and it's easier to start with a dedicated server than to switch later.

Tip: Don't use Notes Server for Netware on a dedicated server. Why pay for another Netware server license, especially when OS/2 Warp Connect's installation is such a no-brainer, so ideally suited to hosting Notes Server, and works just fine with IPX?

Trick: Create your own icons on the server when using OS/2 Warp. In fact, you'll have to if you want icons because Notes installation is designed for pre-Workplace Shell OS/2. The installation program asks if you want to install icons, and defines a group (**Main** is the default). Skip this, and after the installation create two new program icons using the **Program** template in your template folder.

One program should identify *notessvr.exe* in the Required path and filename, with **SERVER** as the Optional parameter. The working directory should be your Notes directory. This will be automatically titled Lotus Notes Server for OS/2. You'll use this to restart Notes Server if you have shut it down for some reason.

The other program should use *notes.exe* and should have no parameters. It will be titled **Lotus Notes for OS/2** and will invoke the Notes Desktop for the server. You'll use this for your administrative activities on the server.

Don't create an icon for **Notes Guided Tour** on your server. The server is not the place to learn notes—do it on a workstation. In addition, the Tour is a Windows application, and this is especially significant considering the next Tip.

Tip: Don't install Win-OS/2. There are no DOS or Windows applications or utilities that you'll need or probably want to run on your Notes Server for OS/2. Not needing that support, you can add **PROTECTONLY=YES** to your server's *config.sys* and get measurably improved performance.

Trick: Use a different name for your administrator ID. You'll get quite a few requests and notices sent to you as administrator. If you have other responsibilities, you may find it easier to keep the administrator ID as a pseudonym, such as just "Administrator," and maintain a separate ID for you, personally. It'll cost you the price of a license, but may be worth much more in efficiency gains.

Tip: Keep it simple. Don't get fancy with the Server, Organization, Domain, and Network Name that Notes lets you specify. Notes is designed to accommodate large enterprise requirements. That doesn't mean you have to use all its capabilities in a smaller implementation.

Keep your names short and use the defaults that Notes enters for you whenever you can.

Trick: Generate user ID's on floppies. Unless your enterprise is using diskless workstations, you can set up your users to easily log onto Notes at any Notes-enabled workstation if they have their user ID floppies with them.

These are just a few of many Tips and Tricks that can help you as a Notes Administrator. If you have one you'd like to share, send it to me at 72241.1006@compuserve.com.

J. C. Love

The second security level is **Server Access**. If you want to connect to a Notes server, you must have already

entered your password, and if not, your Notes will prompt you for it. After entering the valid password, your user

software will ask the server to check to see if you have that server's certificate. Without it, the server will refuse the connection.

The third level is **Database Access**. Database access permissions are contained in an ACL, identifying those who can use the database and what each user can do with it (the fourth level of security). These permissions are called **Access Levels**. For any database to which you have access, your ID file will have an appropriate certificate with your access level for that specific database. The levels are:

- **No access:** This level is so complete that users can't even add the database icon to their workspace.
- **Depositor:** Allows composing a document, but not reading any, even ones composed by the user.
- **Author:** Users can compose and read documents as well as edit those they composed.
- **Editor:** The same privileges as Author, plus users can edit documents composed by anyone.
- **Designer:** The same privileges as

Editor, and users can also perform application and database design functions.

- **Manager:** This level has Designer access, plus it allows definition of the database's replication settings, the modification of the database's ACL, and the deletion of the entire database.

The final level of security is **Encryption**. You can encrypt fields (that are designed to allow encryption) and entire documents with a private or public key method. The North American version of Notes (U.S. and Canada) contains RSA Encryption, a powerful algorithm that makes it so difficult to decipher data encrypted with it that the U.S. government has made it a criminal offense to export any product containing it.

If your organization has locations outside North America, or if you have travelers who may want to connect to your Notes server, make sure you purchase the International version of Notes. This contains a less sophisticated, yet still very robust and secure method of encryption.

One clever feature about the design of Notes' security is that, no matter to whose computer you have access, Notes is easy to use. Many users carry a floppy disk in their pockets with a copy of their *user.id* files. If they need to access Notes, they simply insert their floppy disk in the computer they want to use and select a menu option to switch to another user. The resulting dialog box lets them pick their User ID file on the floppy disk.

Managing security in Notes sounds complex, but in reality it's just the opposite. Certification can be set up in a hierarchical configuration so that levels of certificates inherit from their parents, and only changes to the desired level need be made to child certificates. Certificates are usually delivered to users via Notes Mail but can also be delivered in a file format.

What's next

You'll need to determine how many Notes servers you'll want, select their names, decide if you need more than a single domain (domains are thoroughly discussed in the Notes Administrator's Guide), who will be the server administrator, who will certify IDs, who will support users, and your database manager prerequisites.

A few guidelines that may help you achieve success are:

- start small
- have a defined objective (mail? a document library? an application?)
- arrange and schedule user training
- get training for yourself
- go through the formal Notes professional certification process.

Good luck, and let me know about your challenges and achievements. We'll be visiting Lotus Notes again in the near future, then focusing on the new version, Release 4.

J. C. Love develops and presents technology seminar tours for Right Source Inc. Currently, he is responsible for a 27-city Lotus Notes and IBM PC Server tour. In addition, he consults with small- and medium-sized businesses on information technology issues. J. C. was an IS Manager at UCLA and can be contacted at 72241.1006@compuserve.com.

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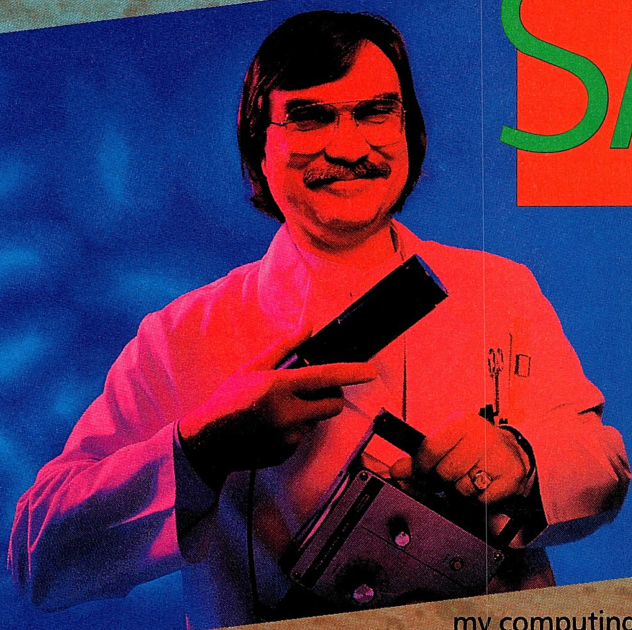
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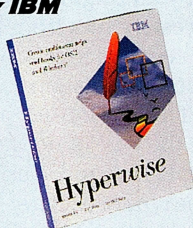


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Using OS/2 as a LAN Server, OS/2 Warp Server, or NetWare client.

By Timothy F. Sipples

Last October, David Moskowitz offered practical advice on how to connect OS/2 Warp Connect with a Microsoft Windows for Workgroups network. In that same spirit, let's talk about two key OS/2 Warp Connect issues you're also likely to face: installation (particularly remote installation) and internetworking with IBM LAN Server, OS/2 Warp Server, and Novell NetWare.

Remote Install

OS/2 Warp Connect is designed for networking; to talk with just about any other system, small or large, over a fast network or back into the office over a dial-up line. Due to the scope of OS/2 Warp Connect, you can only buy it on CD-ROM.

This fact might bring up one problem right away: many PCs are not equipped with CD-ROM drives. Fortunately, as a system designed to network, OS/2 Warp Connect introduces a new Remote Install program—essentially an easy yet effective front end to CID (Configuration, Installation, Distribution) methods, which have been a staple of OS/2 and its applications for years.

What is CID? Loading PCs using floppy disks, one at a time, is extremely inefficient, costing enormous sums. So, software distribution methods evolved across a network for both operating systems and applications. Software that adhere to these standard methods are said to be "CID-enabled."

The Remote Install program in OS/2 Warp Connect is an invitation to use CID without learning all the technical details. After setting up only one "code server" on your network, you can install OS/2 Warp Connect on two, dozens, or even hundreds of PCs. Setting up an OS/2 Warp Connect code server is trivial: just install OS/2 Warp Connect on one system somewhere on the network. That one system might even be the only one with a CD-ROM drive. Use this code server as a "filling station" for desktop and even notebook PCs, temporarily or permanently parked on the network.

Although no built-in copy protection exists to prevent you from installing Warp Connect on as many PCs as you'd like from just one CD-ROM copy of OS/2 Warp Connect, you must have enough licenses to cover the number of PCs you plan to install with the software.

Remote bootstrap

After a successful installation of OS/2 Warp Connect, the Remote Install program can be found inside the OS/2 Warp

Connect Install/Remove folder, which in turn is inside the OS/2 System folder. Because Remote Install is designed to be simple, it omits some sophisticated CID features; we'll focus on ways you can extend the basic Remote Install to get some extra features. (If you would like to pursue more advanced aspects of CID, you can consult *OS/2 Installation Techniques: The CID Guide*, IBM Publication No. GG24-4295 or use IBM's NetView/DM software, now part of the new IBM SystemView for OS/2 and OS/2 Warp Server.)

When starting the Remote Install program, you're first asked to create two Remote Installation floppy disks. These floppy disks start the OS/2 Warp Connect installation at other PCs on the network. They are loaded with just enough networking software to find your original OS/2 Warp Connect system and copy the necessary files from the original OS/2 Warp Connect CD-ROM attached to that system.

You should create Remote Installation floppy disks for each type of PC you install. These boot floppy disks will vary according to two factors: the type of network adapter (make and model) that the target PC has and, if using a PCMCIA (PC Card) network adapter, the type of circuitry (make and model) used to handle that adapter. For example, a pair of floppy disks created for a ThinkPad 360 with IBM PCMCIA Token-Ring adapter will not work with an ethernet-equipped Aptiva or even an AST notebook with the same Token-Ring adapter.

Next, create Remote Installation floppy disk pairs for as many different types of PCs that you plan to install (Figure 1). **DISKCOPY** can be used to duplicate these floppy disks if you need several copies of the same type. Click on the **Other adapter...** button to add an OS/2 Warp driver for any network adapter that isn't listed. (In particular, you can download a driver for the commonly cloned Novell NE2000 ethernet adapter as filename *ne2000wc.zip* on most online services and OS/2 Warp BBSes.)

Use the **Settings** button to confirm or change key network adapter settings. For example, the IBM ThinkPad 701 with IBM PCMCIA Token-Ring requires that the Memory Mapped ROM/IO Address be set to D400 and the Shared RAM Address (RAM) be set to D800. (If you're modifying the *protocol.ini* file directly, change MMIO to 0xD400 and RAM to 0xD800.)

Again, to reduce complexity, Remote Install uses the NetBIOS protocol to communicate between itself (the code server) and the PC started from these boot floppy disks. NetBIOS is fast and effective, but it won't make too many

"hops" on a network. If your network is large and complex, with multiple locations, you may not be able to use NetBIOS beyond one location or one part of the network. You may need to look into the more sophisticated methods previously mentioned. For a small- to medium-sized network, Remote Install is ideal.

Find the code server

NetBIOS depends on a name to find the OS/2 Warp Connect code server. The code server name is up to eight characters long and can be found in the file `\grpware\clients\grpware.ini`. This name must match the name recorded in the `config.sys` file on floppy disk 1 (the second Remote Installation boot floppy disk). If you reinstall OS/2 Warp Connect on your code server system, a new randomly generated name will be assigned. You may need to edit `grpware.ini` to restore the original name. If you need more than one OS/2 Warp Connect code server, you can edit the `config.sys` file on floppy disk 1 of the boot floppy disks to point to a second code server by name.

Your `grpware.ini` file may look something like this:

```
;SRVIFS INI file for GRPWARE - LW74PEHC
Name = LW74PEHC
GroupName = NO
Adapter = 0
MaxClients = 1
MaxFiles = 9999
ClientWorkers = 6
Path = D:\
Alias = ReadOnly,Single,CDROM,D:\
Alias = ReadWrite,Single,STATUS,
      C:\GRPWARE\CLIENTS\LADCLT
```

You can change the NetBIOS name on the code server by changing LW74PEHC to something else. This name must be unique on the network (used only by the code server and the target PC to find each other and communicate). This name isn't related to the workstation name used in OS/2 Peer or LAN Requester, however. You must restart the Remote Install program for the change to take effect.

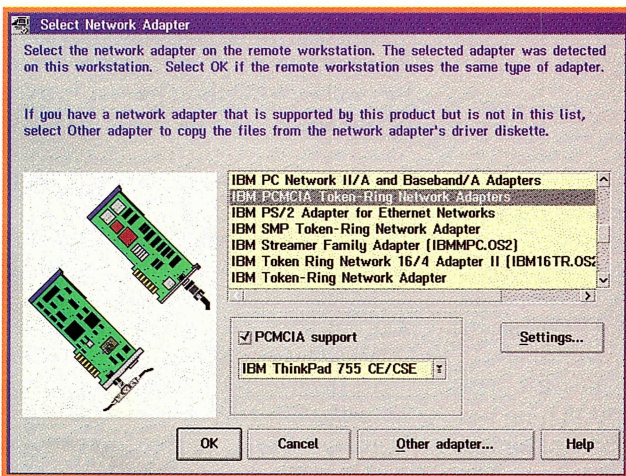


Figure 1: Remote Install—Build the boot floppy disks for each type of system you plan to install.

Maximum clients, maximum time

Another line in `grpware.ini`, `MaxClients`, controls the number of PCs that can load OS/2 Warp Connect from the code server at the same time. By default, this value is set to 1 so that only one PC at a time can be installing from the OS/2 Warp Connect CD-ROM. CD-ROM drives can be relatively slow, therefore, setting this value so low by default might make sense. However, you can increase this number to allow more than one PC to install OS/2 Warp Connect from the code server at the same time. I suggest avoiding values above 5 if possible, and be sure to also increase the `ClientWorkers` value (two lines below) to its maximum value of 12.

If you do increase the `MaxClients` value, you must also make some other changes to key files on the code server and on the Remote Installation floppy disks. The Remote Installation floppy disks contain just enough network capability to find and copy files from the code server. They don't, however, react well when the code server doesn't deliver files in a timely fashion. By increasing NetBIOS timeout values, you can force the networking software on these floppy disks (and the code server) to wait longer when the network (or the PCs on each end of the conversation) takes longer than expected to respond. You should make sure your OS/2 Warp Connect code server has enough capacity to handle distribution: 16MB RAM is generally the minimum. You should also try to restrict use of the code server for other tasks.

Changes are required to two files, `protocol.ini` and `ibmlan.ini`. You must restart your OS/2 Warp Connect PC for the changes to take effect. `protocol.ini` is found in two places: the code server's `\ibmcom` directory and on floppy disk 1 of the Remote Installation floppy disks. `ibmlan.ini` is found in the code server's `\ibmlan` directory (if you have installed OS/2 Peer or LAN Requester).

For the `protocol.ini` file, in the `[netbeui_nif]` section of the file, change or add the following lines using a text editor:

```
ADAPTRATE=0
T1=60000
T1=10000
T2=2000
NETBIOSTIMEOUT=2000
```

If you have installed OS/2 Peer or LAN Requester, also change (or add) the following line in `ibmlan.ini`:

```
SESSTIMEOUT=300
```

and in the peer section of the file, find:

```
SRVHEURISTICS
```

and set bit 15 to a value of 8. Once you make these changes, your OS/2 Warp Connect installations across the network will be more reliable.

Activate the code server

The Remote Install program requires that you click on a few buttons to activate the code server function. You may wish to have the code server ready to deliver OS/2 Warp Connect across the network without typing or clicking the mouse. The

following batch file, *remstart.cmd*, accomplishes that task:

```
C:
CD \GRPWARE\CLIENTS
START
E:\CID\SRVIFS\SERVICE
/INI=GRPWARE.INI
```

Create and save this text file on your code server's hard disk. Then, if you wish, drag a shadow of this batch file to the **Startup** folder so that it will automatically start up every time OS/2 Warp Connect loads. (This example assumes that OS/2 Warp Connect is installed on drive C and that the OS/2 Warp Connect CD-ROM is inserted into drive E. Change the drive letters in this example if needed.)

Now, after preparing the necessary boot floppy disks with the changes to **MaxClients**, **ClientWorkers**, *protocol.ini* (on both ends), *ibmlan.ini* (if present), and the addition of *remstart.cmd* to the **Startup** folder, your enhanced code server is ready for operation. Shut-down and restart the code server, and the **SERVICE** program should respond to any requests for OS/2 Warp Connect installation across the network.

To provide access to other applications, drivers, the BonusPak, and other files, you might use OS/2 Peer. You can share directories, drives (including CD-ROM drives), and other resources from your OS/2 Warp Connect system to other PCs using OS/2 Peer. For example, the following batch file, *reminstl.cmd*, shows how you might access printers and other drivers that ship with OS/2 Warp Connect across the network:

```
@echo off
echo Starting Selective
Install...
echo Use Y:\OS2IMAGE as your
source for
echo install files, when
prompted.
PAUSE
NET USE Y: /DELETE
NET USE Y: \\SMITH\CD-ROM
C:\OS2\INSTALL\INSTALL
NET USE Y: /DELETE
```

In this example, the original OS/2 Warp Connect CD-ROM (or a copy on a hard disk) is given a resource name of CD-ROM on the OS/2 Peer system

More sophisticated CID

Response files. Using prebuilt files with answers to all the installation questions asked, you can avoid sitting at each PC, answering the same questions over and over. REXX scripts provide even more flexibility and automation.

Scheduling. Installing new software or updates can take place at night at predetermined times.

Auditing. The installation programs can report back success or failure to troubleshoot PC software distribution more effectively.

Remote boot. Also known as RIPL (Remote Initial Program Load), you can force PCs to automatically reboot and retrieve new software, without having to use boot floppy disks.

named **SMITH**. This resource is marked read-only to all (using OS/2 Peer's Sharing and Connecting program) and is available to anyone on the network. OS/2 Warp Connect is assumed to be installed to drive C on the target PC. While inside the Selective Install program, *y:\os2image* is available as a source for printers and other drivers. You can change drive letters and names to match your own setup.

From disc to disk

You can speed up the delivery of OS/2 Warp Connect installation files across the network by copying the contents of the OS/2 Warp Connect CD-ROM to a hard disk on the code server. You will need 100MB or more of free space. Run the following commands to copy the necessary files:

```
D:
CD \
XCOPY E:\CID\* \CID\* /S
XCOPY E:\GRPWARE\*
\GRPWARE\* /S
XCOPY E:\OS2IMAGE\*
\OS2IMAGE\* /S
XCOPY E:\*
INSTALL
```

These commands assume you will be copying the contents of the OS/2 Warp Connect CD-ROM from drive E to drive D. They also assume OS/2 Warp Connect is installed on drive C. Change the drive letters as needed.

The **INSTALL** command will run the OS/2 Warp Connect Installation program from the hard disk copy. Doing so resets Remote Install so that it will deliver files from a new drive letter, the hard disk, rather than the CD-ROM disc. Exit

the Installation Program at the first opportunity (it only needs to start up to reset).

Resetting Remote Install also resets *grpware.ini* (including the NetBIOS Name). Edit *grpware.ini* to change the **Name**, **MaxClients**, and **ClientWorkers** values as needed.

Serviceability, Diagnostic Aids, Person to Person

If you choose Advanced Install while installing OS/2 Warp Connect, make sure Serviceability and Diagnostic Aids is selected.

These are required for First Failure Support Technology/2 (FFST/2)—part of OS/2 Warp Connect's standard networking features.

Person to Person, the workgroup conferencing software included in the OS/2 Warp BonusPak, will operate over just about any type of network, including OS/2 Peer. However, Person to Person and OS/2 Peer can interfere with one another if Person to Person uses the NetBIOS protocol. Use another protocol instead (such as TCP/IP) or increase the NetBIOS resources with the MPTS program.

LAN Server and Warp Server

OS/2 Warp Connect includes two separate networking packages that are capable of connecting to LAN Server or the new Warp Server: LAN Requester and OS/2 Peer. OS/2 Peer contains more function than LAN Requester in every respect except one. OS/2 Peer doesn't include the graphical, drag-and-drop server administration software.

You can, however, install both OS/2 Peer and LAN Requester to get access to this tool for administering Warp Server or LAN Server using the following steps:

1. Install OS/2 Warp Connect with LAN Requester first.
2. Make a copy of the **IBM LAN Services** folder and rename it to **Temp LAN Services**.
3. Copy the contents of the directories *\ibmlan\netprog* and *\ibmlan\netlib* to *\templan\netprog* and *\templan\netlib*, respectively.
4. Install OS/2 Peer on top of LAN Requester (using the **PRODINST** program included on the OS/2 Warp Connect CD-ROM).



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5. Copy the files in `\templan\netprog` to `\ibmlan\netprog`, using the **Drives** object in your OS/2 System folder. Find and open the `\templan\netprog` folder, select all files in the folder, and copy them to `\ibmlan\netprog`. Don't replace any duplicate files in `\ibmlan\netprog` (click on **Cancel** when prompted). You should only copy those files in `\templan\netprog` that are not already in `\ibmlan\netprog`.
6. Repeat Step 5 for the `\templan\netlib` and `\ibmlan\netlib` directories.
7. Rename the **Temp LAN Services** folder back to **IBM LAN Services**.
8. Restart your OS/2 Warp Connect PC for changes to take effect.

You may decide to use the new multifunction Warp Server client for OS/2 Warp instead of the version shipping with Warp Connect. You should not install this new client with OS/2 Peer.

Logging on to OS/2 Peer

LAN Server and Warp Server employ the domain concept for logging onto the network. If your network includes LAN Server or Warp Server systems, and you plan on also using OS/2 Peer, first change **IBM-PEERS** to your default domain when you install OS/2 Peer. Then, log onto the network using the LAN Server Logon program in the OS/2 Peer folder (Figure 2).

The Peer Workstation Logon program should be used to enter your user ID and password before using the Sharing and Connecting program. In other words, it should be used when you change, add, or delete resources that are available to others on the network from that particular OS/2 Peer PC, using the administrator ID and password that you set when you started OS/2 Peer for the first time (Figure 3).

Part of the appeal of LAN Server and Warp Server (and unlike peer-to-peer networking schemes) is that one person can easily administer servers from any point on the network, and that all shared resources are attached to the servers. OS/2 Peer, however, offers added flexibility, because any OS/2 Peer user can share modems, printers, directories,



Figure 2: LAN Server logon—Use this program when you have a domain controller handling access to the network.

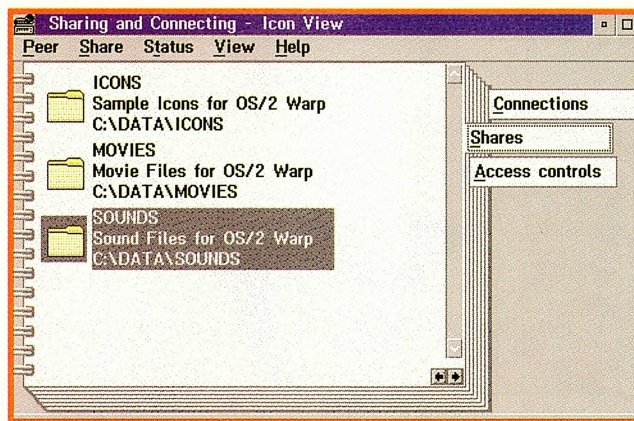


Figure 3: Sharing and connecting—OS/2 Peer's friendly, drag-and-drop tool for sharing resources across the network.

and disks with anyone else. Yet that flexibility means the network is more difficult to administer, because every OS/2 Peer PC maintains its own list of passwords. Suppose, for example, you own a business with 50 employees, each with a PC running OS/2 Peer. When an employee leaves the company, you would have to check each of these 50 OS/2 Peer systems and remove that departing employee's user ID.

To avoid that work, an OS/2 Warp Server or LAN Server system can act as the domain controller to handle all the logons. OS/2 Peer has a feature called forwarded authentication, which lets the server handle the logon. Suppose I have a printer attached to my OS/2 Peer PC and I want everyone in the office to have access to it. I don't, however, want anyone who has left the company to use it. If forwarded authentication is enabled on the OS/2 Peer system, anyone who has a valid logon on the domain controller can use that printer.

Novell NetWare

We now have OS/2 Warp administration tools for Novell NetWare 4.x servers. To obtain them, download the file `os2utp.exe`, a self-extracting archive, from the IBM BBS at (919) 517-0001, or call up your favorite online service. You don't have to run plain Windows to administer a NetWare 4.x server anymore.

More advanced CID methods (installing OS/2 Warp Connect from a Novell NetWare server, for example) may require determining your network adapter's universally administered address. You can do so using this OS/2 command (provided as part of the NetWare server software):

```
USERLIST /A
```

The line you'll see marked with an asterisk ("*") indicates your current login session to the server with your network adapter's address. Multiprotocol Transport Services (MPTS), part of OS/2 Warp Connect, requires this address information in order to install on top of the Novell NetWare client for OS/2. You can use this technique in the course of your own CID methods.

If you're using your network adapter's universally administered address (a 12-digit hexadecimal code burned into the adapter as a unique identifier), and you install OS/2 Warp Connect with NetWare support, it will correctly determine that address and properly configure the NetWare client to use it. If you need to use MPTS to manually set up IBM NetWare Requester Support (perhaps to use a locally administered address), make sure you use the correct format for the Network Adapter Address field (Figure 4).

The 12-digit hexadecimal code must be preceded by an "I" (ethernet) or "T" (Token-Ring). Other protocols selected with MPTS (and the network adapter itself) use the normal format for the Network Adapter Address field (the 12-digit address without the extra letter in front), and then only when you don't wish to use the universally administered address. (The IBM NetWare Requester Support Network Adapter Address field

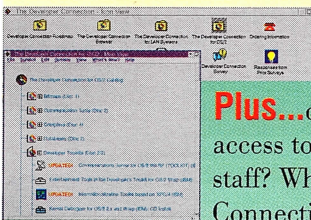
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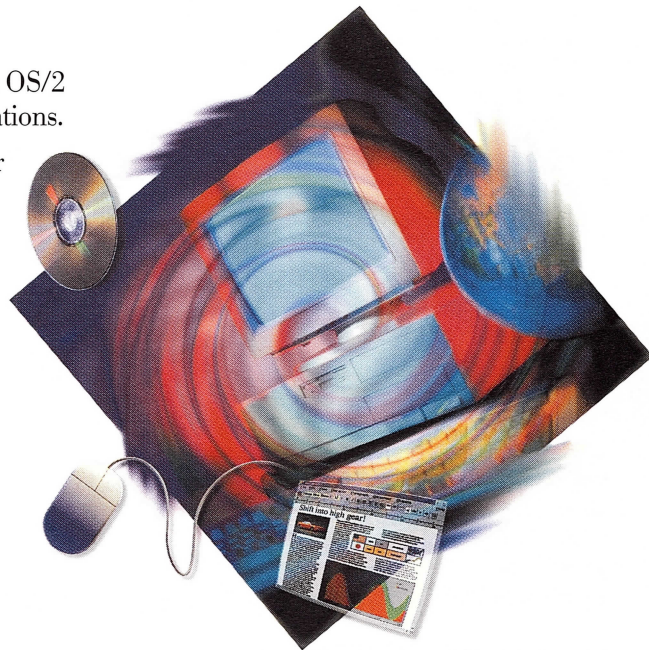
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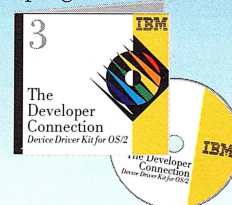
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& Tips Techniques

Tip: Sometimes in an OS/2 window it's useful to go straight to the end of scrolling text. For example, when you type **DIR** and the directory is large and the text scrolls for a while.

Technique: Move the mouse pointer to the title bar of the window and then press either mouse button for a second or two.

Tip: Save time when typing commands in an OS/2 window by recalling one command in particular, without scanning through the list of previously used commands by using the Up Arrow Key.

Technique: Instead of using the Up Arrow key, just type a few characters of the command you want to recall and press **F1** until you find the command you want to execute.

Tip: Copy new versions of DLLs used by Presentation Manager (PM) and/or the Workplace Shell during development.

Technique: Near the end of the **CONFIG.SYS** insert the **CALL=\OS2\CMD.EXE** statement. This will give a command prompt after Kernel initialization but before PM initialization. PM will not initialize until you enter **EXIT**.

Q's & A's

Question:

Is it possible to have multi-line text in a STRINGTABLE?

Answer:

Yes. Use `'\xA'` as a newline character.

```
#define IDS_SPLITSTRING 212

STRINGTABLE {
    IDS_SPLITSTRING, "This string is
    split\xA across two lines."
}
```

Question:

Can I split the text in notebook tabs by putting a '\n' in the text?

Answer:

No. The notebook tab can only display text in a single line. If you want to split the text, you will have to draw it yourself. If you do not send the notebook a **BKM_SETTABTEXT** or **BKM_SETTABBITMAP** message, it will send the owner a **WM_DRAWITEM** anytime a tab needs painting. You can then parse the text to be written by looking for the new line character, and draw the individual lines of text yourself using **WinDrawText** or the **GpiCharStr** variants. You need to set the tab size to be large enough to hold the text and you can use **WinDrawText** or **GpiQueryTextBox** to calculate the needed tab size. You can change the size of the tabs using **BKM_SETDIMENSIONS** to make them large enough to hold your text.

Question:

I want my secondary windows to appear indented under the primary window entry in the task list, just as the Workplace Shell does for different views of the same object. What's the trick?

Answer:

The only way you can do this is by subclassing the Window List and doing the shuffling yourself. The Window List is a container. What you see is not the container's tree view.

When another view of an object is opened in the shell or a process is started from one of the objects, the Window List is manipulated to provide the indented look. The indentation is managed by adding spaces to the start of some entries in the list. In these cases, an extraneous dummy entry is added to the one requested by the caller, to serve as a group title to the real entries that follow it. Whenever any item is added or deleted, the Window List is reworked and dummy entries are added or destroyed as necessary.

To summarize, no API is provided for an arbitrary process to group its windows beneath a group title. This is a Workplace Shell privilege.

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OS/2 Warp Connect

must always be filled in properly.) Adapter addresses are recorded in the `\ibmcom\lantran.log` file each time you start your OS/2 Warp Connect PC.

NetBIOS over IPX

If you're using IPX as your networking protocol, and you don't want to use NetBIOS natively on the same network, OS/2 Warp Connect can give you the option of using NetBIOS emulation over IPX. NetBIOS communications are wrapped up (encapsulated) into IPX for sending and receiving across the network. Here's the procedure for using NetBIOS over IPX:

- Install OS/2 Warp Connect normally with the Novell NetWare client and any additional networking software you wish to use.
- Edit `config.sys` and remove the **REM** in front of the two Novell NetBIOS lines:

```
DEVICE=C:\NETWARE\NETBIOS.SYS
RUN=C:\NETWARE\NBDAEMON.EXE
```

- Start MPTS. If the IBM logo appears, click on **OK**. Then, click on **Configure**. Next, LAN adapters and protocols should be selected and **Configure** clicked on again. After a moment, a window appears with a section called **Current Configuration**. Your network adapter should be listed along with the network protocols that it's set to use. If listed, highlight **IBM OS/2 NETBIOS**, click on **Remove**, and then confirm by clicking on **Yes**. In the Protocols section of the window, you should see NetWare NetBIOS Emulation over

IPX as one of the selections. Highlight **NetWare NetBIOS Emulation** and click on **Add**. Then click on **OK**, **Close**, **Exit**, and **Exit** again to save these changes.

- Check to make sure that the `netbios.sys` file in the `\netware` directory is dated January 9, 1995 or later. If not, replace it with the most up-to-date version available. (You might download Novell's latest updates for the NetWare Client 2.11 for OS/2 from CompuServe's NETWARE forum. At press time the most recent was `os2c2.exe`.)
- If you've installed OS/2 Peer or LAN Requester to use with OS/2 Warp Connect, you must tell them to use NetBIOS over IPX instead of native IBM NetBIOS. To do so, locate and run the Install program (in the OS/2 Peer or LAN Services folder). If the IBM logo appears, click on **OK**. On the Installation Tasks panel, select **Configure this workstation** and click **OK**. Go through the remaining questions without making any changes (primarily by clicking on the **No** and **OK** buttons). Allow the Install program to save all your selections (none of which you changed).

Restart your OS/2 Warp Connect PC, and NetWare NetBIOS Emulation over IPX should be operating properly. Use NetBIOS over IPX if you need to keep native NetBIOS off your network or if you have a particular application (such as a database gateway) which requires it.

When you install the OS/2 NetWare client, `netx.exe` is added to the `autoexec.bat` file so that it's available to DOS and Windows software. It may not be needed and, in most cases, it may be safely removed to provide as much conventional memory as possible to DOS and Windows applications. You may wish, however, to load `netx.exe` into high memory. First, make sure that the line:

```
DOS=LOW,NOUMB
```

in `config.sys`, is changed to:

```
DOS=HIGH,UMB
```

Then, in the `autoexec.bat` file, change:

```
C:\NETWARE\NETX.EXE
```

to:

```
LOADHIGH C:\NETWARE\NETX.EXE
```

Finally, many network adapters (especially Token-Ring) use large blocks of upper DOS memory, preventing `netx.exe` from loading high. You may wish to switch your Token-Ring adapter so that it uses **ALTERNATE** memory addresses instead of the **PRIMARY** set. To do so, two changes may be required. First, adjust the switch settings on the Token-Ring adapter itself, and second, modify the settings for the Token-Ring adapter using MPTS. Also, shutting off EMS memory (in DOS Settings) can free upper memory for `netx.exe`. **OS/2**

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References

OS/2 Installation Techniques: The CID Guide (IBM Pub. No. GG24-4295) introduces these and other software distribution concepts. It provides a cookbook for developing your own CID techniques. IBM publications may be ordered by calling (800) 879-2755. Information on IBM redbooks can also be found on the World Wide Web at <http://www.redbooks.ibm.com/redbooks>.

You may also refer to the `readme.cid` file (located on the Installation floppy disk) for a cursory introduction to the CID utilities that ship with OS/2 Warp. Also, another redbook, *OS/2 Warp Generation, Volume 2: Exploring LAN Connectivity With OS/2 Warp* (IBM Pub. No. GG24-4505) provides additional insight.

Finally, *OS/2 Magazine* has published two previous articles about CID: "Making it Up in Volume," July 1994, p. 39; and "Breaking the 80/20 Rule with CID," January 1995, p. 33.

This article is derived from a discussion of OS/2 Warp Connect in *The Official IBM OS/2 Warp FAQs* by Michael Kaply and Timothy Sipples, published by IDG Books/IBM Press.

Acknowledgements

My thanks to John Case and Mark Neumann (both at IBM) for contributions.

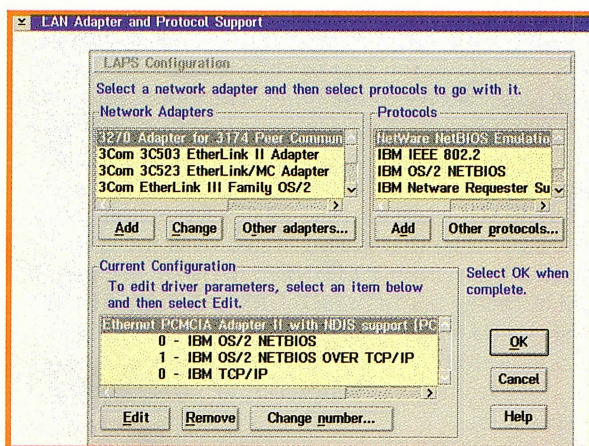


Figure 4: MPTS—The basic network configuration utility in OS/2 Warp Connect.

Using the REXX APIs in DB2/2

Accessing the DB2/2 database through REXX. By Merrill Callaway

DB2/2 without DB2/2 front end? Not a problem, if you'd like to use REXX. The DB2/2 "engine" (which does the work) is equipped with multiple access methods, one of which is through REXX API calls.

In general, the two types of transactions with DB2/2 are administrative tasks and queries. All transactions are accomplished by command strings, either issued interactively from an OS/2 window running the DB2/2 command processor, Database Manager (DBM), or through several APIs (Application Program Interfaces), which allow interprocess control (IPC) from other processes written in C, FORTRAN, or REXX. Each language has one or more APIs designed to match the syntax and structure of the language with the requirements of the DB2/2 engine.

This article explores the use of the REXX APIs in DB2/2, which are DLLs (dynamic link libraries containing REXX function sets for controlling DB2/2 through DBM). Because DBM has the role of preparing and binding an optimized binary executable from the command strings that it receives interactively, the syntax of the REXX APIs is somewhat non-intuitive. We assume a fair knowledge of DB2 and REXX—this is not an introductory-level tutorial.

API access

REXX programs may access DB2/2 through two APIs as well as through data structures. The APIs factor all the functions available through the interactive DBM into REXX functions. Internal DB2/2 data structures are wrapped into REXX compound symbols and stems. (See *OS/2 Magazine*, "REXX Interprocess Control," January 1996, p. 22). REXX API functions are registered to the system just like any other DLL.

Once registered, whenever a REXX DB2/2 function is executed, then certain specifically named REXX compound symbols are assigned values automatically. These values mirror the value of internal data structures in the DB2/2 engine. For example, certain REXX function calls will assign specifically named compound symbols the name of the database, the name of a certain table in a database, or the value of a certain field in a record. In this way, data may be retrieved directly by a REXX program. DB2/2 maintains two REXX APIs, one for administrative transactions and one for SQL (Structured

Query Language) queries. SQL is a script language used in most databases for retrieving formatted data reports.

Each API is a set of string commands with their associated syntax rules included—in other words, a specialized command set of the REXX language. Let's outline the steps to write a REXX program to control and query DB2/2.

What we're trying to accomplish is a REXX program, to be launched in an OS/2 window, that displays a list of all DB2/2 databases cataloged on the system. Users are prompted to type in a database name from the names displayed. A list of tables from that database is then displayed. Users type in a table name from that list, after which they can enter a SQL **SELECT** statement, choose a default **SELECT** statement that retrieves everything in the table, or view the table's column names to help construct the **SELECT** statement. The report finally generated is written to a file.

SQL embedded in REXX

The main REXX program is named *dbsql.cmd* (Listing 1). It immediately makes three calls to *DBMStart.cmd*, *DBGet.cmd*, and *DBTabGet.cmd* (external REXX functions listed below). The *DBMStart.cmd* function (Listing 2) registers the necessary REXX API function packages and starts DBM (Database Manager). *DBERR.cmd* (Listing 3) handles errors that may occur when calling SQL or DB2/2 API functions. The *DBGet.cmd* function (Listing 4) displays a list of databases cataloged on the system and allows the user to choose one of them. It returns the user's choice to the caller. The *DBGetTab.cmd* function (Listing 5) displays the tables inside that database and allows the user to choose a table. This function then returns the chosen table name to the main program.

SQLDBS and **SQLEXEC** are external REXX function packages (the DB2/2 APIs) that are registered with the system using the REXX function **RXFUNCADD()**. The program starts DBM by calling one of the **SQLDBS** functions, 'START DATABASE MANAGER'. The **SQLCA** data structure stands for SQL Communication Area. **SQLCA.SQLCODE** contains the return code from any function call to a DB2/2 or SQL REXX API function.

If **SQLCA.SQLCODE=0**, then the function call was successful. If it is positive, then there was success with an exception, such as a warning. If the return code is negative, an error

DB2/2 Through REXX

occurred. If `SQLCA.SQLCODE=-1026`, then DBM is already active (not a problem). A test, therefore, looks for a nonzero return code that is not -1026. Any other nonzero problem causes a **SIGNAL ERRORHANDLER** instruction to jump to the label **ERRORHANDLER**: at the end. **SOURCELINE(SIGL-1)** displays the line causing the error. *DBERR.cmd*, an external REXX function, displays detailed error information via an OS/2 command to look up the error reference in *dbmsg.inf* (the DB2/2 online error-message book).

General API vs. REXX API syntax

The "general API" call **OPEN DATABASE DIRECTORY SCAN**, stores the directory of databases in the system into memory (see *DB2/2 Programming Reference*, Topic 1.34). REXX programs coded to open a database **ON 0** (the system), instead of **ON C**: (or some other local drive letter) ensure that the programs will work on a network.

The syntax for the REXX version of any DB2/2 general API involves finding the general API in the Programming Reference. The REXX syntax reference will be at the end (see *DB2/2 Programming Reference*, Topic 6.3.32). Here's a general API function in REXX syntax (all on one line):

```
CALL SQLDBS 'OPEN DATABASE
    DIRECTORY ON 0 USING :DBList'
```

Variables are always preceded by a colon (:). Put the DB2/2 and SQL command strings in quotes. The DB2/2 REXX API function calls will be preceded by **SQLDBS**; and all of the embedded SQL commands will be preceded by **SQLEXEC** (see *DB2/2 Programming Reference*, Chapter 6).

:DBList is a stem token (array), the elements of which get assigned values during the API function call (do not put a period after this stem). The keyword **USING** allows private-named variables. DB2/2 data structure names should never be used for private variable names. The above function assigns the following values:

```
DBList.0 = 2           The number
                        of elements in the variable
                        (always 2).
DBList.1 = scanid      REXX host
                        variable to identify the scan.
DBList.2 = N           Number of
                        entries N in the scanned
                        directory.
```

A loop from 1 to **DBList.2** displays the databases on the system. The second DB2/2

function call is the general API **GET NEXT DATABASE DIRECTORY ENTRY** (see *DB2/2 Programming Reference*, Topics 1.26 and 6.3.23). The REXX syntax (all on one line)

```
CALL SQLDBS 'GET DATABASE DIRECTORY ENTRY
    :DBList.1 USING :DBentry'
```

gets the next entry in the directory scan list and assigns its value to the compound REXX variable **DBentry.2**. The scan is determined by **DBList.1**, the scanid found previously. If you omit **USING :DBentry**, then the default stem **SQLDINFO** (a data structure) would be used. Whatever stem, this time there are nine nodes for nine internal values. **DBentry.2** con-

Listing 1: The main program, DBSQL.cmd.

```
/* DBSQL.cmd Data Base SQL */
/*
** Start DB2/2 DataBase Mgr DBM
** and register DB2/2 REXX API functions.
**/

rc=DBMStart()
IF rc='ERROR' THEN EXIT 5

/*
** The following function gets and displays a list of all
** cataloged databases. After user picks one, its name
** is returned by the function.
**/
databasename = DBGet() /* Call DBGet as a function(). */
IF databasename = 'ERROR' THEN EXIT 5

/*
** Disconnect from any active databases.
** Connection may be to only one database at a time.
**/
CALL SQLEXEC 'CONNECT RESET';
IF (SQLCA.SQLCODE \= 0 & SQLCA.SQLCODE \= -1024) THEN
    SIGNAL ERRORHANDLER
    /* SQLCA.SQLCODE = -1024 means not connected. */

/* Connect to databasename. */
CALL SQLEXEC 'CONNECT TO ' databasename ' IN SHARE MODE'
IF (SQLCA.SQLCODE \= 0) THEN SIGNAL ERRORHANDLER

/* Get a list of tables in the database. */
DBtable = DBGetTab() /* Call DBGetTab as a function(). */
IF DBtable = 'ERROR' THEN EXIT 5

/* Prepare dynamic SQL Varying List SELECT statement. */
GETSEL: /* Entry point for program control. */
/* Trialrun is used to display a list of columns in a table. */
trialrun = 0
/* Colname is a string to display all the columns in a table. */
colname = ''

SAY 'Press Enter to use default SELECT statement:'
SAY 'SELECT * FROM' DBtable
SAY 'OR enter your own SELECT statement.'
SAY 'Enter C or Columns to see a list of the columns in table.'
```

cont'd on p. 36

tains the database name. After the loop, the program closes the database directory (with scanid equal to **DBList.1**) to free the resources used by **OPEN DATABASE DIRECTORY SCAN**.

The database is already connected, so **DBGetTab.cmd** (Listing 4) displays a list of tables in that database.

The REXX program must embed a dynamic SQL **SELECT** statement, so that at run time the REXX API calls will return a result table identical to that which would have been returned by the equivalent interactive SQL statement through DBM. DBM maintains a table, **SYSIBM.SYSTABLES**, which is a "table of tables" for each database. Each table in this table has a creator and a table name. The "table of tables" has a creator, **SYSIBM**, and the table name is **SYSTABLES**. This table lists itself as one of the system tables. From Query Manager or DBM, run this SQL statement (all on one line):

```
SELECT * FROM
  SYSIBM.SYSTABLES
```

Now run this SQL statement (one line; case-sensitive names):

```
SELECT * FROM
  SYSIBM.SYSTABLES WHERE
  CREATOR <> 'SYSIBM'
  AND CREATOR <> 'QRWSYS'
```

Only nonsystem tables should display. Because of the dynamic nature of the SQL statement, the REXX API dictates that these creator names be parameterized with markers "?" for which values are later substituted. You can't place a variable name directly into the select statement without causing errors.

Variable names are not resolved until **OPEN CURSOR**, when the two names for the **CREATOR** strings, **'SYSIBM'** and **'QRWSYS'**, replace the "?" parameter markers in the **SELECT** statement. In the program, **pv1='SYSIBM'** takes the place of the first "?" and **pv2='QRWSYS'** takes the place of the second. The parameters are always replaced in the same order as their replacing variables occur, separated by commas.

Displaying the database tables involves seven steps, which must be

Listing 1: Cont'd from p. 35.

```
PARSE PULL statement
IF statement='' THEN statement = 'SELECT * FROM ' DBtable
IF ABBREV('COLUMNS',TRANSLATE(statement)) THEN DO
  trialrun=1
  /* Program will go back to GETSEL after finding columns. */
  /* Use the following to obtain ALL (*) column names. */
  statement='SELECT * FROM' DBtable
END

/* Prepare statement and load column info into SQL variable sqllda */
/* Note: s1, c1, and SQLDA must be so named. */
CALL SQLEXEC 'PREPARE s1 INTO :sqllda FROM :statement'
IF ( SQLCA.SQLCODE \= 0) THEN SIGNAL ERRORHANDLER

/* Declare cursor... */
CALL SQLEXEC 'DECLARE c1 CURSOR FOR s1'
IF ( SQLCA.SQLCODE \= 0) THEN SIGNAL ERRORHANDLER

/* Open cursor... */
CALL SQLEXEC 'OPEN c1'
IF ( SQLCA.SQLCODE \= 0) THEN SIGNAL ERRORHANDLER

/* Fetch first row... */
CALL SQLEXEC 'FETCH c1 USING DESCRIPTOR :sqllda'
IF ( SQLCA.SQLCODE \= 0) THEN SIGNAL ERRORHANDLER

header =,
'Query results for table' DBtable 'in database' databasename'.'
blankheader = ''

/* NOTE: Set your output filespec here. */
output='C:\text\DBOUT.TXT'

/* Write header. */
CALL LINEOUT output, blankheader
CALL LINEOUT output, header
CALL LINEOUT output, blankheader

/* Column information... */
colheader = '' /* for final report */
colunder = '' /* for final report */
columndisplay = '' /* for trialrun */

DO col = 1 TO sqllda.sqlld /* No. of columns. */
  /* Get column name. */
  colname = sqllda.col.sqlname

  /* Check datatype for DECIMAL type = 485. */
  dtype = sqllda.col.sqltype
  /* If decimal type then add two components of compound sqllen. */
  IF (dtype=485 | dtype=484) THEN
    n=sqllda.col.sqllen.precision+sqllda.col.sqllen.scale
  ELSE n=sqllda.col.sqllen /* Length of column data. */
  /* Make column underline. */
  colunder=colunder||COPIES('-',n)
  /* Make column names. */
  colheader=colheader||colname
  /* Make column names for display. */
  columndisplay=columndisplay||colname||' '
END

/* If user chose to display column information. */
```

cont'd on p. 38

performed in the following order (match the KEY words below to the program listings to see the proper syntax of these steps):

1. **PREPARE** a dynamic SQL **SE-**

LECT statement called **s1**. (Parameter markers go here.)

2. **DECLARE** a cursor, **c1**, for the statement **s1**.

3. **OPEN** the cursor **c1**. A cursor in a



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Listing 1: Cont'd from p. 36.

```

IF trialrun THEN DO
  SAY ''
  SAY 'Column names for the table' DBtable,
    'in database' databasename:''
  SAY ''
  SAY columndisplay
  SAY ''

  /* Must close open cursor before preparing new SQL statement. */
  CALL SQLEXEC 'CLOSE C1'
  IF (SQLCA.SQLCODE \= 0) THEN SIGNAL ERRORHANDLER
  /* Go back to label GETSEL: for new SELECT statement. */
  SIGNAL GETSEL
END

/* Write the column information and underlines. */
CALL LINEOUT output, colheader
CALL LINEOUT output, colunder
/* End of column information. */

/* Loop prepares records recovered from database by SELECT. */
DO UNTIL (SQLCA.SQLCODE \= 0)
  record = ''

  /* Loop from col 1 to number of columns, sqlda.sqlda */
  DO col = 1 TO sqlda.sqlda
    IF (sqlda.col.sqlind) = -1 THEN /* -1 means a null column */
      record = record||'- '
    ELSE
      /* If data is in the column, concatenate it to the record. */
      record = record||sqlda.col.sqldata||' '
  END
  CALL LINEOUT output, record /* Write output record. */
  /* get next row */
  CALL SQLEXEC 'FETCH c1 USING DESCRIPTOR :sqlda'
END /* DO UNTIL */

/* Clean up, close cursor, and commit work. */
CALL SQLEXEC 'CLOSE c1'
IF (SQLCA.SQLCODE \= 0) THEN SIGNAL ERRORHANDLER

CALL SQLEXEC 'COMMIT'
IF (SQLCA.SQLCODE \= 0) THEN SIGNAL ERRORHANDLER

/* Disconnect from database. */
CALL SQLEXEC 'CONNECT RESET'
IF (SQLCA.SQLCODE \= 0) THEN SIGNAL ERRORHANDLER
CALL LINEOUT output
EXIT 0

ERRORHANDLER:
PARSE SOURCE . . thisfile
CALL DBERR SQLCA.SQLCODE
SAY 'SQL non-zero return code SQLCA.SQLCODE=' SQLCA.SQLCODE
SAY 'Caused by source line' SIGL-1 'in file' thisfile
/* Line before signal branch */
SAY SOURCELINE(SIGL-1)
/* Return ERROR string to caller. */
EXIT SQLCA.SQLCODE

```

database keeps track of a position in the result table. (Parameter values resolved here.)

4. **FETCH** the cursor **c1** (on the first line) INTO :tablename, :creatorname (REXX variables for the table name and

the creator of the table). In a loop, **FETCH** the rest of the lines the same way. After the first **FETCH**, a loop handles each remaining **FETCH**. The first **FETCH** is outside the loop to catch any major error that may occur. The loop

iterates **UNTIL** (tested at the end of the block of instructions) the return code, **SQLCA.SQLCODE \= 0**; that is, until its return value is 100, signifying that the cursor is past the end of the file.

5. **CLOSE** the cursor (good housekeeping).

6. **COMMIT** the unit of work. (Always commit, even for read-only. Locks may be placed on the data until the unit of work is committed.)

7. **CONNECT RESET** (disconnects from the database and resets the environment). Include **CONNECT RESET** only when this code is to be a stand-alone function. No need to break the connection when returning to caller, *DBSQL.cmd*, because it will need to continue making queries of this same database.

The main DB2/2 REXX program

The main program lets us select a database and a table from it and then builds an interactive SQL **SELECT** statement to generate a report.

Because only one database at a time may be connected, *DBSQL.cmd* performs a **CONNECT RESET** to clear any connections in preparation to connecting to the database name returned from **DBGet()**. The program now performs a **CONNECT TO** database name **IN SHARE MODE**. This connect is the only one necessary during the DB2/2 section of our project.

Varying list SELECT statements

Now our program needs to construct another dynamic SQL **SELECT** statement, except this time, nothing is known in advance about how many columns exist or what is in them. The dynamic SQL statement issued from *DBGetTab.cmd* anticipated the existence of the first two columns of data and selected only from them.

What if our program has no information about how many columns might be in the database or what type of data might be in them? A varying-list **SELECT** statement solves this problem, using another of the DB2/2 data structures—**SQLDA**, wrapped as a REXX stem. **SQLDA** stands for SQL

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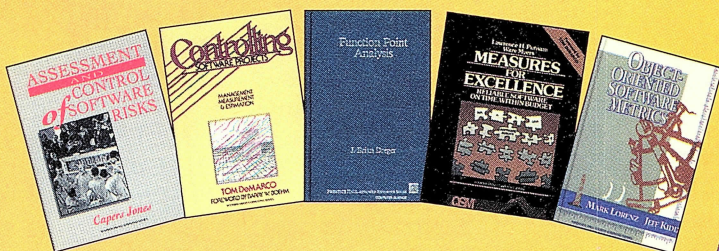
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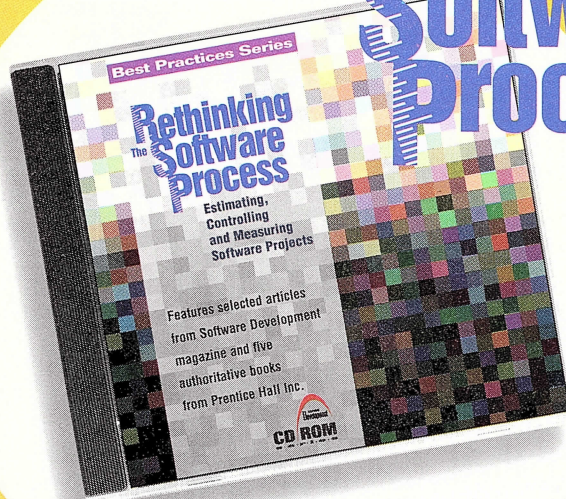
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Listing 2: DBMStart.cmd.

```

/* DBMStart.cmd */
/*
** Called by DBSQL.cmd
** Starts Data Base Mgr and registers SQLDBS and SQLEXEC libraries.
*/

/* Suppress echoes. */
'@echo off'

/* Are the libraries registered? */
IF RXFUNCQUERY('SQLDBS') \= 0 THEN DO
  RC = RXFUNCADD('SQLDBS', 'SQLAR', 'SQLDBS')
  IF RC \= 0 THEN DO
    SAY 'SQLDBS registration error: RC = ' RC
    EXIT rc
  END
END

IF RXFUNCQUERY('SQLEXEC') \= 0 THEN DO
  RC = RXFUNCADD('SQLEXEC', 'SQLAR', 'SQLEXEC')
  IF RC \= 0 THEN DO
    SAY 'SQLEXEC registration error: RC = ' RC
    EXIT rc
  END
END

/* Start database manager. */
SAY ' DataBase Manager loading .... '
CALL SQLDBS 'START DATABASE MANAGER'
IF (SQLCA.SQLCODE \= 0 & SQLCA.SQLCODE \= -1026) THEN
  SIGNAL ERRORHANDLER
/* SQLCA.SQLCODE=-1026 means DBM is running already. */

/* Functions need to return a value. */
EXIT 0

/* Error handling. */
ERRORHANDLER:
/* Get this file spec. */
PARSE SOURCE . . thisfile
CALL DBERR SQLCA.SQLCODE
SAY 'SQL non-zero return code SQLCA.SQLCODE=' SQLCA.SQLCODE
SAY 'Caused by source line' SIGL-1 'in file' thisfile
/* Line before signal branch */
SAY SOURCELINE(SIGL-1)
/* Return ERROR string to caller. */
EXIT 'ERROR'

```

Listing 3: DBERR.cmd.

```

/* DBERR.cmd external REXX function. */
/* Argument: SQLCA.SQLCODE (SQL return code). */
ARG sqlcode
sqlcode = STRIP(sqlcode,'L','-' ) /* remove minus (-) sign */
/* pad code with zeros on the left */
IF LENGTH(sqlcode) < 4 THEN sqlcode = RIGHT(sqlcode,4,'0')
/* Change this path to match your error book directory! */
'START /PM VIEW C:\SQLLIB\BOOK\DBMSG.INF SQL'||sqlcode
EXIT 0 /* Function returns something. */

```

```
CALL SQLEXEC 'CONNECT TO
databasename IN SHARE MODE'
```

1. Connect to the database and allow others to share it.

```
CALL SQLEXEC 'PREPARE s1 INTO
:sqlda FROM :statement'
```

2. This call puts the contents of the **SQLDA** data structure into a REXX stem, **sqlda**, when the statement executes. **PREPARE** is not an interactive SQL statement; it is only used from the API. The REXX variable **sqlda** must be so named, to match the data structure in DB2/2 (see *DB2/2 SQL Reference*, Topic 5.29).

```
CALL SQLEXEC 'DECLARE c1
CURSOR FOR s1'
```

3. This call declares the cursor, which corresponds to **s1** and tracks the position in the database result table.

```
CALL SQLEXEC 'OPEN c1'
```

4. This call opens the cursor. Cursors are opened for each SQL **SELECT** statement and are closed before the next **SELECT** statement. This program uses more than one **SELECT** statement.

```
CALL SQLEXEC 'FETCH c1 USING
DESCRIPTOR :sqlda'
```

5. This is the same **FETCH** we have seen before, but the keyword **DESCRIPTOR** is new. The **FETCH** in the *DBGetTab.cmd* program used the **INTO** keyword to fetch the first two columns into two REXX host variables. **USING DESCRIPTOR :sqlda** tells **FETCH** to use the REXX stem **sqlda** to contain the data from one row returned by **FETCH**.

Because elements of the array **sqlda** contain column information, this method becomes a shorthand way to get several pieces of information at once. A loop fetches every line of the result table for processing.

```
CALL SQLEXEC 'CLOSE c1'
```

6. **CLOSE** the cursor after each **SELECT** statement is finished, and the program is through processing the result table.

Descriptor Area. The various nodes of the **SQLDA** array contain information about the columns and their data type. The steps necessary are similar to those seen before, except for the additional

code that deals with retrieving REXX values from **SQLDA**.

The seven **SQLEXEC** functions used to build a varying-list **SELECT** statement are as follows (all on one line):


```
CALL SQLEXEC 'COMMIT'
```

7. Always COMMIT a unit of work, even if it's read-only. This is the last thing the program must do before disconnecting from the database. The cursor must be closed before each new SELECT statement, but only one COMMIT is necessary.

Inside the SQLDA data structure

Look at the structure of SQLDA (see *DB2/2 SQL Reference*, C.0 Appendix C). SQLDA is a multidimensional array used two ways: in PREPARE and DESCRIBE, SQLDA returns information to the application program about a prepared statement; in OPEN, FETCH, and EXECUTE, SQLDA assigns values to REXX variables. Here, PREPARE uses SQLDA to return information about the number of columns, their names, their data types, and other such things. Then SQLDA is used by FETCH to assign values to REXX compound symbols mirroring the internal data structure.

Think of each column in the resulting table as containing five pieces of information. If there are n columns in the table, then there will be $n \times 5$ SQLDA elements describing the column information. The $n \times 5$ SQLDA elements are collectively known as SQLVAR, a two-dimensional array; the first node of which is the column number, and the second is one of the five pieces of information about that column: name, data type, length, value, and null indicator (see below).

SQLDA consists of a collection of four compound variables (SQLDA.SQLDAID, SQLDA.SQLDABC, SQLDA.SQLN, and SQLDA.SQLD) followed by SQLVAR (the collection of $n \times 5$ SQLDA elements). Besides SQLVAR, only one of the four SQLDA data structure elements is of interest to a REXX program: SQLDA.SQLD, which contains n , the number of SQLVAR element groups (or the number of columns in the result table).

REXX equivalents to SQLDA elements

Case is not important, but the REXX host stem `sqlda` is written in lowercase, in the following examples, to differentiate it from the SQL data structure SQLDA.

Listing 4: DBGet.cmd.

```
/* DBGet.cmd List of databases on system. */

SAY 'Searching for all cataloged databases...'
SAY ''

CALL SQLDBS 'OPEN DATABASE DIRECTORY ON 0 USING :DBlist'
IF SQLCA.SQLCODE \= 0 THEN SIGNAL ERRORHANDLER

/* Display databases. */
DO i=1 to DBlist.2 /* DBlist.2 contains number of databases */
  CALL SQLDBS,
  'GET DATABASE DIRECTORY ENTRY :DBlist.1 USING :DBentry'
  SAY ' ' DBentry.2 /* DBentry.2 contains database name. */
  SAY ''
END

/* Clean up */
CALL SQLDBS 'CLOSE DATABASE DIRECTORY :DBlist.1'
IF SQLCA.SQLCODE \= 0 THEN SIGNAL ERRORHANDLER

/* Get database name from user. */
SAY 'Enter database name to query.'
PULL databasename

/* Return database name. */
EXIT databasename

ERRORHANDLER:
/* Get this file spec. */
PARSE SOURCE . . thisfile
CALL DBERR SQLCA.SQLCODE
SAY 'SQL non-zero return code SQLCA.SQLCODE=' SQLCA.SQLCODE
SAY 'Caused by source line' SIGL-1 'in file' thisfile
/* Line before signal branch */
SAY SOURCELINE(SIGL-1)
/* Return ERROR string to caller. */
EXIT 'ERROR'
```

Listing 5: DBGetTab.cmd.

```
/* DBGetTab.cmd */

/*
** Called by DBSQL.cmd; Lists all tables for database;
** RETURNS name of table and creator to calling program.
*/

SAY ''
SAY 'Tables in' databasename 'database:'
SAY ''

/*
** Make dynamic SQL SELECT statement with 2 unknowns:
** ? is a Parameter Marker.
** NOTE: SQL MUST use <> for \=, unlike REXX which can use either.
*/
st='SELECT name,creator FROM sysibm.systables WHERE',
  'creator <> ? AND creator <> ?'
CALL SQLEXEC 'PREPARE s1 FROM :st'
IF (SQLCA.SQLCODE \= 0) THEN SIGNAL ERRORHANDLER

/* C1 and s1 MUST be named as such: c1 thru c100 and s1 thru s100.
*/
CALL SQLEXEC 'DECLARE c1 CURSOR FOR s1'
IF (SQLCA.SQLCODE \= 0) THEN SIGNAL ERRORHANDLER
```

cont'd on p. 42

Listing 5: Cont'd from p.41.

```

/* Do not view system tables. */
pv1= 'SYSIBM'
pv2= 'QRWSYS'
/* Fill in parameter markers: '?' */
CALL SQLEXEC 'OPEN c1 USING :pv1,:pv2'
IF (SQLCA.SQLCODE \= 0) THEN SIGNAL ERRORHANDLER

/* Fetch first line, put first two columns from table */
/* into tablename and creatorname. */
CALL SQLEXEC 'FETCH c1 INTO :tablename,:creatorname'
IF (SQLCA.SQLCODE \= 0) THEN SIGNAL ERRORHANDLER

/* Loop until there are no fetch results. Display table names. */
DO UNTIL (SQLCA.SQLCODE \= 0)
    SAY 'Table = ' STRIP(creatorname)||'|'||STRIP(tablename)
    CALL SQLEXEC 'FETCH c1 INTO :tablename, :creatorname'
END

/* Close cursor. */
CALL SQLEXEC 'CLOSE C1'

IF (SQLCA.SQLCODE \= 0) THEN SIGNAL ERRORHANDLER
/* Always commit a unit of work even if read only. */
CALL SQLEXEC 'COMMIT'
IF (SQLCA.SQLCODE \= 0) THEN SIGNAL ERRORHANDLER

/* Ask user for a table name from the list. */
SAY 'Enter table to query.'
PULL tablename

/* Return table name entered by user. */
EXIT tablename

ERRORHANDLER:
/* Get this file spec. */
PARSE SOURCE . . thisfile
CALL DBERR SQLCA.SQLCODE
SAY 'SQL non-zero return code SQLCA.SQLCODE=' SQLCA.SQLCODE
SAY 'Caused by source line' SIGL-1 'in file' thisfile
/* Line before signal branch */
SAY SOURCELINE(SIGL-1)
/* Return ERROR string to caller. */
EXIT 'ERROR'

```

■ **sqlda.sqld** (REXX variable) – The number of host variables described by occurrences of SQLVAR; equivalent to the number of columns, *n*, in the table. Represent the columns by SQLDA.1 to SQLDA.*n*. For each of the columns, five elements exist in the two-dimensional array, SQLVAR (the collection of all elements below).

■ **sqlda.n.sqltype** (REXX variable) – This variable shows the data type in column *n* (see *DB2/2 SQL Reference*, C.3).

If **sqlda.n.sqltype** = 484 (decimal and no nulls allowed in this column) or **sqlda.n.sqltype** = 485 (decimal and nulls are allowed in this column), then **sqlda.n.sqlllen** (length of data) becomes the sum of two 3-dimensional compound symbols.

sqlda.n.sqlllen.precision = *p*, the precision or number of whole digits including sign and decimal point. **sqlda.n.sqlllen.scale** = *s*, the scale or the number of digits after the decimal point. The total length of data for a decimal is **sqlda.n.sqlllen.precision** + **sqlda.n.sqlllen.scale**, including sign and decimal point. In the number +123456.12, for example, *p*=2, and *s*=8, therefore, the total data length is 10.

■ **sqlda.n.sqlllen** (REXX variable) – This data shows the length of it in column *n* (see above).

■ **sqlda.n.sqldata** (REXX variable) – The actual value of the data is shown in column *n*. Recall that the cursor moves down the table to each row as FETCH executes. So just after each FETCH, this REXX

host compound variable will contain the data from column *n* and whatever row the cursor was just on.

■ **sqlda.n.sqlind** (REXX variable) – This variable is the null indicator. If this value is -1, then the column contains a null. Nulls (no data in column *n* at some row) are either allowed or not allowed in column data when the table is set up.

■ **sqlda.n.sqlname** (REXX variable) – This is the column name. Our program will use this element to display a list of column names to assist the user to input a SELECT statement.

DBSQL.cmd program flow

At the label GETSEL:, the *DBSQL.cmd* program starts to prepare a dynamic, varying-list SQL SELECT statement. The three choices include:

■ (Default: Press <Enter>) The program prepares a **SELECT * FROM DBTable** statement to return data from all columns of the table, in order.

■ The user can perform a trial run, which displays a list of column (field) names when entering "C" or "Column" when prompted for a SELECT statement. The user may view column names as often as desired to help in preparing the final SELECT statement.

■ If the user enters anything else, the program attempts to prepare it as a SELECT statement. At the end of the user input, the REXX variable, **statement**, contains some form of SQL SELECT statement. (No code is available to check the validity of the statement; that is left as an exercise for the reader.)

The actual construction of the final SQL statement is the familiar boilerplate code used to make a dynamic, varying-list SQL SELECT statement. Recall the order: PREPARE s1, DECLARE c1, OPEN c1, FETCH c1 USING DESCRIPTOR :sqlda.

As a header, the program writes a blank line, an explanatory heading, and a blank line to the output file. Next, there are three tokens that will be concatenated into long strings from initial null strings. **colheader**, for the column names, and **colunder** is a line of hyphens underlining each column

name. The third token, **columndisplay**, is simply a list of column names to display in case the user inputs "C."

Before these tokens can be written or displayed, they must be built up in a DO loop running from **col = 1** to **sqlda.sqlld** (the number of columns). The token, **colname**, holds the name of each column returned in **sqlda.col.sqlname**, and the token, **dtype**, takes the **datatype** returned in **sqlda.col.sqltype**. These assignments simplify the required expressions. A test for decimal data type of 484 or 485 assigns the correct value to **n**, the data length. The REXX function **COPIES()** makes **n** copies of hyphens in a row. **colheader** and **columndisplay** are constructed as each new piece is concatenated during each loop iteration.

A block **IF** handles the case of a **trialrun=1** where we want a display of column names. The cursor is closed prior to building the next **SELECT** statement. Finally, the program control passes back to the **GETSEL:** label.

For a trial run, only the first line of the result table needs fetching in order to assign values to **sqlda**. Processing the

final **SELECT** statement requires a loop to fetch the rest of the data from the result table. This is similar to the loop used in **DBGetTab.cmd** but has additional code to build up the data record in the loop nested inside the **FETCH** loop. The inner loop goes from **col=1** to **sqlda.sqlld**, the number of columns, just like before, except now, it is fetching record data and not column names. The first test is for null data when **sqlda.col.sqlind = -1**. If so, it concatenates a hyphen to signify null data. Each data field is concatenated to **record**, followed by a space. A **FETCH** ends the outer loop as before, advancing to the next row. If a nonzero code is returned, **UNTIL** ensures that the loop will finish without further ado.

Finally, more boiler-plate code handles the housekeeping. Cut and paste this code to construct your own REXX programs to query or administer DB2/2 databases.

OS/2

Merrill Callaway, a former aerospace senior logistics engineer, is the author of two REXX books, The ARExx Cookbook

(Amiga REXX) and The REXX Cookbook (REXX in OS/2). He is a member of the REXX Language Association, Team OS/2, and the founder of Whitestone, a publishing company for technical books. He can be reached at callaway@indirect.com on the Internet.

Resources:

IBM Document Nos.

S62G-3662-00 through S62G-3670-00
(DB2/2 References)

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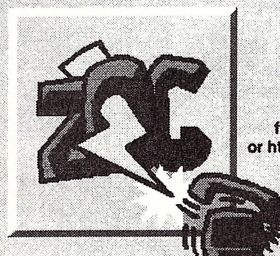
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Distributed Objects

BY ROGER SESSIONS

Let's try a quick psychological test. I'll put forth a word, and I want you to say the first word that comes to mind. Are you ready? Here's the word: SOM. Most likely, this word elicited one of three reactions: perplexity, a better object model, or a better C++.

SOM technology was first introduced with OS/2 2.0. The first-ever article about SOM appeared in the 1992 winter issue of *OS/2 Developer* (p.107), written by Nurcan Coskun and myself. Over the following three years, SOM was imbued with a variety of new features, including one that should have guaranteed it a place in the annals of software history.

This critical feature added to SOM 2.0 was the ability to distribute objects. SOM was the first serious commercial implementation of the Object Management Group's CORBA model, which defined an industry standard architecture for distributing objects.

The fact that so few people think of object distribution when they hear the word SOM, is a sad testimony to IBM's marketing ability or lack thereof. IBM has consistently failed to realize the importance of object distribution and has given a muddled story of what SOM is all about.

This reality is SOM's gloomy past. Fortunately, there is some bright news on the horizon. The upcoming release of SOM has been redesigned, with object distribution as the focal point of the release. If IBM can figure out how to market this capability, with half the aplomb that Sun has shown toward marketing Java (a big "if"), we might have a real winner.

In this column, let's introduce writing distributed objects with SOM. All of

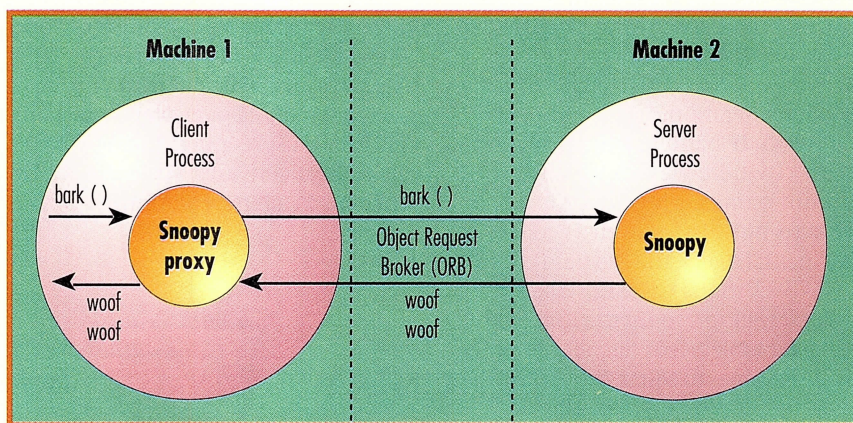


Figure 1: Distributed SOM architecture.

the code examples work with the current 2.1 release. To simplify the examples and concepts, we'll use the C language bindings for SOM.

Distributed object applications

Distributed object technology is important, because it's the most natural mechanism we have for doing distributed programming. If we are object-oriented programmers, then we already know about combining behavior and data into little packages that we call objects. With object distribution, we now have the ability to take these little packages and move them to other processes.

From the program's point of view, no difference exists between using local or remote objects. In either case, we'll have an object. That object contains state or data. We interact with the object through well-defined method invocations. Because the state of an object is only of internal concern to the object, we don't care where that state actually resides. Our code works fine, as long as the invoked methods can find the right target object, regardless of

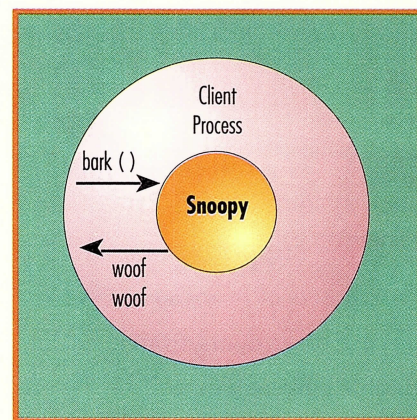


Figure 2: Distributed SOM architecture as seen by client.

whether that object lives in our address space or in another.

It's similar to the concept of remote procedure calls (RPC), which is probably the most widely recognized paradigm for distributed programming. However, procedure calls can only be distributed when procedures have been carefully designed with distribution in mind. Objects are naturally encapsulated, so any well-

The World of Objects

designed object is a good candidate for being a unit of distribution. Besides, object-oriented programming has a host of advantages over procedural programming.

Any business that organizes its activities over a network of computers is a natural for distributed object technology, especially if these businesses are also under pressure to rapidly respond to changes in the marketplace. Prime examples include banks, insurance companies, and retail outlets, among many others.

Basic SOM definitions

Let's take a closer technical look at this technology. We start by looking at some distributed SOM definitions. Distributed SOM is often referred to as DSOM, but in SOM 3.0 the distinction between SOM and DSOM will likely be de-emphasized.

Object: An object is just that, an object; it knows how to respond to method invocations. If it's a dog object,

say Snoopy, it knows how to respond to the bark method.

Proxy: A proxy looks similar to a traditional object, but is just a front for an object. It responds to the same methods as traditional objects, but does so by forwarding the invocation to some actual object. If it's a dog-proxy object, say the Snoopy-proxy, it implements bark by interacting with SOM to forward the bark invocation to the actual Snoopy object. From the client's perspective, the Snoopy-proxy appears to actually be Snoopy. Only SOM knows the difference.

Server Process: All objects live in some process running on some machine. The process in which the actual Snoopy lives is called the server process for Snoopy, or sometimes just the Snoopy Server.

Client Process: All method invocations originate from some process. The process, from which a particular bark invocation originates, is considered the client process for that particular method invocation. Many different client pro-

cesses can be invoking methods on a given Snoopy.

Object References: A proxy can be turned into an object reference, which can be used to create a new proxy. The new proxy will then be a front for the same object as the original proxy. For example, if we create an object reference from Snoopy-Proxy and then generate a new proxy from that object reference, say Snoopy-proxy2, both Snoopy-proxy and Snoopy-proxy2 will pass their method calls through to the same object, namely, Snoopy. Object references take the physical form of a standard C/C++ string.

Object Request Broker (ORBs): The ORB is an underlying distribution mechanism used to pass information between proxies and objects. It's not visible to the client or object code.

SOMD_OBJECTMGR: SOMD_ObjectMgr is a global object available to any distributed SOM process. This global object knows how to, among other things, instantiate objects remotely, create object references from proxies, and create proxies from object references.

Listing 1: C implementation of dog.

```
#ifndef SOM_Module_dog_Source
#define SOM_Module_dog_Source
#endif
#define dog_Class_Source

#include "dog.ih"

SOM_Scope void SOMLINK setBark(
dog somSelf,
Environment *ev,
string newBark)
{
    dogData *somThis = dogGetData(somSelf);
    _myBark = (string)
        SOMMalloc(strlen(newBark)+1);
    strcpy(_myBark, newBark);
}

SOM_Scope string SOMLINK bark(
dog somSelf,
Environment *ev)
{
    string returnString;
    dogData *somThis = dogGetData(somSelf);

    returnString = (string)
        SOMMalloc(strlen(_myBark) + 1);
    strcpy(returnString, _myBark);
    return returnString;
}
```

Listing 2: Instantiating Snoopy.

```
1. #include <somd.h>
2. #include <dog.h>
3. #include <stdio.h>
4.
5. void main()
6. {
7.     dog snoopy;
8.     string IDString;
9.     FILE *idFile;
10.    Environment *ev = SOM_CreateLocalEnvironment();
11.
12.    SOMD_Init(ev);
13.
14.    snoopy = _smdNewObject(
        SOMD_ObjectMgr, ev, "dog", "");
15.
16.    IDString = _smdGetIdFromObject(
        SOMD_ObjectMgr, ev, snoopy);
17.
18.    idFile = fopen("id.dat", "w");
19.    fprintf(idFile, "%s", IDString);
20.    fclose(idFile);
21.
22.    _smdReleaseObject(SOMD_ObjectMgr, ev, snoopy);
23.
24.    SOMD_Uninit(ev);
25.    SOM_DestroyLocalEnvironment(ev);
}
```


The architectural relationship between these components is shown in Figure 1. We have a lot of flexibility in configuring client and server processes. For example, they could both be running in a single machine, they could be on two separate OS/2 boxes, or the client could be running on an OS/2 box and the server on an MVS, AIX, or AS/400 box—a configuration particularly likely when the objects must interact with corporate databases.

The architecture, as seen by the client, is much simpler. Clients don't see proxies, ORBs, Servers, or remote machines. From the client perspective, the architecture is as shown in Figure 2.

Sample code

Let's look at one of our standard dogs. The dog definition, *dog.idl*, is:

```
#include <somobj.idl>

string bark();
void setBark(
    in string newBark);
implementation {
    string myBark;
    dllname = "dog.dll";
};
```

```
};
};
```

This example defines a dog that responds to two methods: **bark**, which returns a string containing the dog's bark, and **setBark**, which is used to tell the dog what its bark is.

The C code implementing these methods is shown in Listing 1. Notice that nothing exists in the dog implementation that knows whether or not the dog is going to be distributed.

The first will instantiate a Snoopy object, the second will tell Snoopy what his bark is, and the third will ask Snoopy to bark. These three different programs are running in three different processes, and the Snoopy object is in a fourth.

In Listing 2, Line 1 includes the distributed SOM header file. Line 12 initializes the distributed SOM run time. Line 14 asks the **MD_ObjectMgr** to instantiate a new remote object by typing "dog." Although the client believes a "dog" has been returned, what has actually been returned is a proxy to the remotely instantiated dog. Line 16 creates an object reference for Snoopy. Line 17 to 19 opens a file by the name of *id.dat* and writes into it Snoopy's object reference.

Line 21 tells **SOMD_ObjectMgr** that the proxy is no longer needed. Lines 23 and 24 close down the system.

When the program completes, this client process is no longer active. However, a remote server process is still running, which contains a live Snoopy object that is ready to accept method invocations.

In Listing 3, Snoopy is told what his bark is in Program 2. With Listing 3, many of these lines are obvious by comparison to Program 1. Lines 15 to 17 open the *id.dat* file and read in the object reference. Using shared files is the standard SOM 2.1 out-of-the-box mechanism for sharing object references. SOM 3.0 is expected to introduce a naming service, which will allow processes to share object references via well-known names. It's not difficult to implement a naming-type service using SOM 2.1, but it does require some advanced SOM programming knowledge.

Line 19 asks the **SOMD_ObjectMgr** to create a proxy from the object reference. Line 21 tells Snoopy his bark. Of course, it's actually the Snoopy-proxy that is told, and this proxy passes the information on to the actual Snoopy. Line 23 to 25 releases the proxy and cleans up.

Listing 3: Setting Snoopy's bark.

```
1. #include <somd.h>
2. #include <dog.h>
3. #include <stdio.h>
4.
5. void main()
6. {
7.     dog snoopy;
8.     char IDString[200];
9.     FILE *idFile;
10.    boolean done = FALSE;
11.    Environment *ev =
12.        SOM_CreateLocalEnvironment();
13.    SOMD_Init(ev);
14.
15.    idFile = fopen("id.dat", "r");
16.    fscanf(idFile, "%s", &IDString[0]);
17.    fclose(idFile);
18.
19.    snoopy = _somedGetObjectFromId(
20.        SOMD_ObjectMgr, ev, IDString);
21.
22.    _setBark(snoopy, ev, "Woof Woof");
23.
24.    _somedReleaseObject(
25.        SOMD_ObjectMgr, ev, snoopy);
26.    SOMD_Uninit(ev);
27.    SOM_DestroyLocalEnvironment(ev);
28.}
```

Listing 4: Asking Snoopy to bark.

```
1. #include <somd.h>
2. #include <dog.h>
3. #include <stdio.h>
4.
5. void main()
6. {
7.     dog snoopy;
8.     char IDString[200];
9.     boolean done = FALSE;
10.    FILE *idFile;
11.    Environment *ev = SOM_CreateLocalEnvironment();
12.
13.    SOMD_Init(ev);
14.
15.    idFile = fopen("id.dat", "r");
16.    fscanf(idFile, "%s", IDString);
17.    fclose(idFile);
18.    snoopy = _somedGetObjectFromId(
19.        SOMD_ObjectMgr, ev, IDString);
20.
21.    printf("Snoopy says %s\n", _bark(snoopy, ev));
22.
23.    _somedReleaseObject(SOMD_ObjectMgr, ev,
24.        snoopy);
25.    SOMD_Uninit(ev);
26.    SOM_DestroyLocalEnvironment(ev);
27.}
```


Most of the remote-specific code has to deal with either creating or freeing object proxies. This code is expected to be simplified in SOM 3.0 through a mechanism described as local/remote transparency, meaning that the same client code will work for both local and remote objects. Again, programming techniques are available for local/remote transparency even in SOM 2.1, but they require advanced programming abilities.

When Program 2 starts, it starts as a new client process, independent of the client process from which Program 1 ran. When this program completes, it then exits. The server process containing Snoopy, who now thinks his bark is "Woof Woof," is still running.

The program in Listing 4 is very similar to Program 2 (Listing 3). The only significant difference is line 20, which asks Snoopy (actually the Snoopy-proxy) to bark. The result of this program, which demonstrates how the Snoopy Server has evolved its state as the three different client processes have come and gone, looks

like the following:

Snoopy says Woof Woof.

Reflection

We have looked at a simple example that was meant to demonstrate the manipulation of remote objects. Similar mechanisms can be used for highly complex objects representing, say, store inventory, customers, or bank accounts.

The main difficulty in programming remote objects has to do with the proxy. As we discussed, this difficulty can be ameliorated using advanced programming techniques and is expected to be simplified in 3.0, although the code shown here will still work.

Distributed object technology allows flexible, sophisticated, and distributed applications to be built quickly. With the rapid growth of the Internet, the demand for highly interactive distributed applications is expected to grow rapidly. SOM, with its ubiquitous presence on the IBM product line and beyond, is well positioned to be the major contender in this field.

To date, IBM has been unfocused in the object field as new products come in from every direction with no obvious coordinated overall strategy. Even within the SOM products line, there appear to be multiple directions. If SOM is to be successful, IBM must get focused. It needs to realize that it can't do everything. IBM has great technology for doing object distribution. Object distribution is an important field. Now is the time for IBM to turn its technical strengths into marketing triumphs. **TSZ**

Roger Sessions is president of ObjectWatch Inc., a company specializing in training and consulting in the use of CORBA technologies on IBM platforms. He has spoken at over 30 conferences and has written extensively. His books include Object Persistence: Beyond Object-Oriented Databases, Class Construction in C and C++; Object-Oriented Fundamentals, and Reusable Data Structures for C. Roger also publishes an Internet newsletter called ObjectWatch on SOM and can be contacted via e-mail at roger@fc.net.

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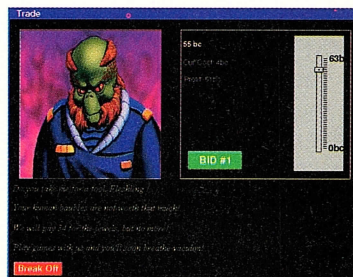
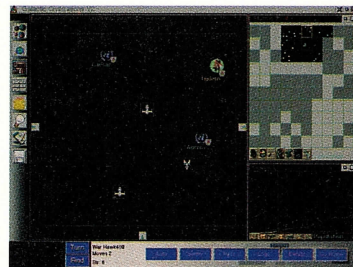
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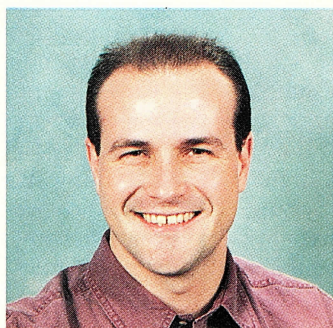
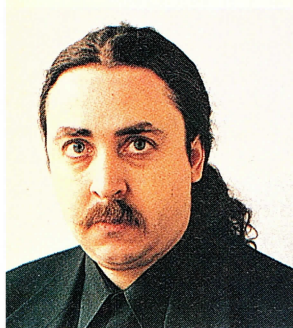
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DBCS: Double-Byte Your Pleasure

BY MARK BENGE AND MATT SMITH

For many of us, DBCS is just another four letter word and, in some cases, a dirty word. Why? Because DBCS is poorly documented and, where it is documented, it's poorly explained.

What we'll try to do here is present a concise and simplified view of DBCS and how to enable DBCS in your own applications, without having to rewrite them.

What is DBCS?

DBCS stands for Double-Byte Character Set. In National Language circles, a second four-letter word exists, SBCS, which stands for Single-Byte Character Set. It includes ASCII, which we all know and love.

DBCS is used in Asian countries such as Japan, China, Korea, and Taiwan. Unlike the English language, which is composed of 26 letters that are combined to form words, the Asian languages are comprised of several thousand kinds of characters.

Since ASCII, which is what most computers use to handle text, is only 8-bits wide, it leaves us with just 255 possible characters. This amount is not enough to represent an Asian-language character.

One solution that has been used for awhile is DBCS. With it, the Asian language is represented by two bytes instead of one, hence the term Double-Byte Character Set.

The concept is quite simple; however, the actual implementation is somewhat more complex on the operating-system level. As for the application level, an application can be DBCS enabled or it can be just SBCS enabled.

To understand DBCS better, let's look at a word in English represented in

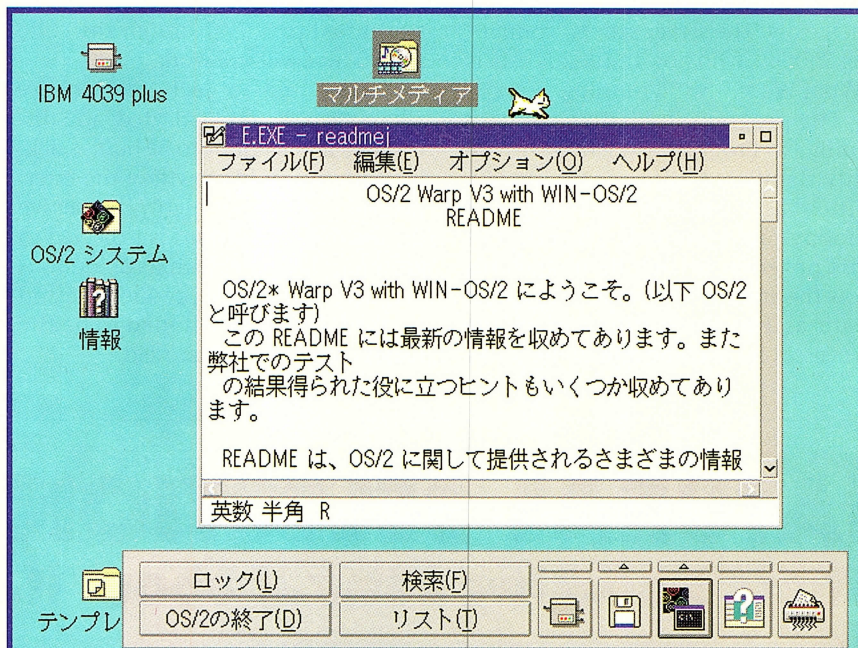


Figure 1: DBCS version of OS/2 Warp.

ASCII and the same word represented in DBCS. The ASCII is:

Japan
4A 61 70 61 6E

The DBCS string is:

日本
93 FA 96 7B

The common characteristic of the two is that they are represented as byte streams. This fact is extremely important in understanding DBCS. As long as you treat your character input as byte streams, absolutely no difference between an SBCS implementation, such as ASCII and DBCS, can be found.

The DBCS first principles

What are the first principles for DBCS? Well, a DBCS character is a combination of two bytes. For a DBCS two-byte combination to be considered a DBCS character, the first byte must be within a defined range.

This range can differ depending on the country. For example, the first byte range for Japan (also referred to as Kanji) is 0x81 to 0x9F and 0xE0 to 0xFC. The second byte range is 0x40 to 0x7E and 0x80 to 0xFC.

Now, understanding this point, it might seem that life has gotten really complicated. Not really. OS/2 provides an API `DosQueryDBCSenv`, which in effect returns the ranges. You use it to determine if the character you are looking at is DBCS.

DBCS characters can be mixed with SBCS characters. For example:

日本 is Japan
93 FA 96 7B 20 69 73 20 4A 61 70 61 6E

Remembering the byte stream rule, you don't have to worry how the string is displayed—just its contents.

Also, if the first byte of a DBCS character is valid and the second byte is not valid, the character is still viewed as being a DBCS character.

So how do you determine if the character is a DBCS character? Take a look at the code in Listing 1.

This code is all the magic that is required to get the DBCS lead byte characters and to determine if a character is a DBCS character.

The fun part

However, a bit more exists to DBCS, because it becomes a bit tricky in the manipulation of the byte stream. You might think that this part is trivial, but it's not.

Consider the following:

C:\日本\Japan

The path contains DBCS characters. Now it's valid under OS/2 and is one of the areas that can affect your application.

One of the problems you might encounter is how you parse this string. What you have to do is check each byte in the string to see if it's a valid DBCS first byte. If the character is not a valid DBCS first byte, it should be considered an SBCS. If the character is a valid DBCS first byte, the next byte should be treated as a DBCS second byte and never be separated from the first DBCS byte.

Simple you might think, but remember earlier when we said that the DBCS characters fall within a byte range? So guess who's coming to dinner? The

backslash character (\)...Yum, yum!

This character is the best to focus on, since it can affect you greatly when you're trying to manipulate file names and paths. Because a given character might be part of a DBCS character, you can't just use `strchr` or `strrchr` to find it. You have to check each character to see if it's part of a DBCS character. This

part is where the `ulQueryCharDBCS` function that was shown before is used. For example, you could replace the `strchr` function with the code in Listing 2, in which the function basically does the same thing as the standard `strchr`, except that it checks to see that the character is a valid SBCS character before approving the comparison.

Listing 1: Determining if a character set is DBCS.

```
#define TYPE_SBCS                0x0000UL
#define TYPE_DBCS_1ST            0x0001UL
#define TYPE_DBCS_2ND            0x0002UL
#define MAX_LEADBYTE             256
#pragma pack(1)
typedef struct _DBCSVECTOR
{
    BYTE bLow;
    BYTE bHigh;
} DBCSVECTOR;
#pragma pack( )
/* --- DBCS Support ----- */
BOOL afLeadByte[MAX_LEADBYTE]; /* Lead bytes Array */
BOOL fDBCS = FALSE; /* Double Byte System */
COUNTRYCODE cc = { 0, 0 }; /* Country Code */
DBCSVECTOR aDBCSVector[8]; /* DBCS Vector */
BOOL fQueryDBCS(VOID)
{
    register INT i, n; /* Loop Counters */
    if ( DosQueryDBCSEnv(8UL * sizeof(DBCSVECTOR), &cc, (PCHAR)aDBCSVector) )
        return(fDBCS = FALSE);
    else
    {
        for ( i = 0; i < 8; i++ )
            if ( aDBCSVector[i].bLow && aDBCSVector[i].bHigh )
            {
                for ( n = (INT)aDBCSVector[i].bLow; n <=
                    (INT)aDBCSVector[i].bHigh; n++ )
                    afLeadByte[n] = fDBCS = TRUE;
            }
        else
            return(fDBCS);
    }
    return(fDBCS);
}
ULONG ulQueryCharDBCS(const CHAR *pszString, INT n)
{
    ULONG ulDBCSType = TYPE_SBCS; /* DBCS Type */
    register INT i; /* Loop Counter */
    for ( i = 0; i <= n; i++ )
        switch ( ulDBCSType )
        {
            case TYPE_SBCS :
            case TYPE_DBCS_2ND :
                ulDBCSType = afLeadByte[pszString[i]];
                break;
            case TYPE_DBCS_1ST :
                ulDBCSType = TYPE_DBCS_2ND;
                break;
        }
    return(ulDBCSType);
}
```


Listing 2: Confirming an SBCS character.

```

PSZ strchrDBCS(const CHAR *p, INT c)
{
    CHAR *pch;    /* Character String Pointer */
    ULONG ulDBCS; /* DBCS Type Holder */
    if ( !fDBCS )
        return(strchr(p, c));
    else
    {
        for ( pch = (CHAR *)p; *pch; pch++ )
            if ( *pch == (CHAR)c )
                if ( (ulDBCS = ulQueryCharDBCS(p, (INT)
                    (pch - (CHAR *)p))) == TYPE_SBCS
                )
                    return(pch);
                else
                    if ( ulDBCS == TYPE_DBCS_1ST )
                        ++pch;
        return(NULL);
    }
}

```

In essence, what you really have to worry about when manipulating DBCS strings is the second DBCS byte. You have to determine that each character is one type or the other before manipulating it. You can do this action by starting from the beginning (yes, the beginning) of the string. You can't just jump into the middle and start interrogating any given character.

Likewise, you can't start from the back of the string. Remember, a backslash is a valid second character, therefore, you can't just type:

```

if ( szPath[strlen(szPath) -
    1] == '\\'
)

```

to determine if the end of a path contains a backslash. The last character might very well be a second byte of a DBCS character. Ultimately, the presence of this character means that the end of your path doesn't have the backslash.

The DBCS Rules

The basic DBCS rules to remember include:

- DBCS two-byte codes must be handled as a single logical character, meaning they shouldn't be separated. If you have to destroy or replace the character, the two-byte code should be deleted or replaced.
- When parsing a DBCS string, check

each character in the string to be sure that a valid DBCS first byte has a valid DBCS second byte following it and these two bytes should not be separated.

- DBCS second-byte characters can be any SBCS character including the backslash (0x5C). Scanning strings for characters must be done with the DBCS first byte checking to find a valid SBCS character.
- DBCS words are not separated by space characters.
- DBCS strings are left aligned, not centered.
- DBCS characters don't have upper/lowercase combinations. DBCS characters can't be converted.
- Treat your character string buffers normally. If the buffer is *x* bytes wide, then that is all that can be entered as SBCS or DBCS.

With these rules under our fur, how does this affect us in our applications? Basically, your string manipulation routines. You might have to construct replacement routines for the following string functions: **memchr**, **memcmp**, **memcpy**, **memmove**, **memset**, **strcat**, **strchr**, **strcmpi**, **strcpy**, **stricmp**, **strlen**, **strlwr**, **strncat**, **strncmp**, **strncpy**, **strnicmp**, **strrchr**, **strstr**, and **strupr**.

Programming concerns

To enable your applications for DBCS, first check to see if DBCS is being used

on the current machine and then retrieve the DBCS lead bytes. The **fQueryDBCS** function from Listing 1 does just that. It determines if DBCS is being used and builds a lead byte array using the information returned back from the **DosQueryDBCS** API.

Next, determine which string routines you use that should take DBCS into consideration. Using the **ulQueryCharDBCS** function, you can then determine, within these replacement functions, the handling of the DBCS and SBCS characters.

Finally, replace the standard string functions in the appropriate places in your code with the DBCS-enabled string functions.

PM considerations

The only thing you have to do in PM, beyond setting up the DBCS environment, is enable your entry field and combo box controls by using the **ES_DBCS** or **ES_MIXED** styles. Treat the length of the entry field and the setting and retrieving of text the same.

Testing

As for testing your applications, the ultimate testing requires proper hardware that allows you to type DBCS characters, but this action is not absolutely necessary.

You will find on the Developer Connection CD files that have DBCS characters within them. For example, on DevCon 8, we have a file in the root directory, *readmej*, which is the Japanese version of the *readme* file. You can then take strings from this file and copy them into entry fields or test scripts, making sure that you are handling the character strings properly.

You might want to be careful when editing these types of files, depending on the capabilities of your editor. If the editor doesn't like upper ASCII characters, it might strip them out, thereby corrupting the DBCS characters.

You will probably want to test your application, where paths or file names are used, especially if you manipulate paths and file names. One of the best tests is to create a DBCS character string where a DBCS second character is a backslash. This string will allow you to make sure that you are parsing the path correctly. Also, you might want to cre-

ate a DBCS path where the last character in the path is the second-byte DBCS character, a backslash.

Double the pleasure

Similar to DBCS is a double-byte character system. We will present the double feature to our DBCS journey next when we talk about the effects of DBCS on your GUI applications. Stay tuned and remember, keep your stick on the ice. **OS/2**

Mark Benge, IBM Software Solutions, RTP, N.C., is a staff programmer who joined IBM in 1989 and has worked on various CUA '91 controls for OS/2 2.x. He works in IBM open class library development, where he develops class library code for OS/2 and Windows. Mark has a B.S. in computer science from Western Carolina University. He can be reached on CompuServe at 73532,2063 or via the Internet at banzai@raleigh.ibm.com

Matt Smith, Prominare Inc., Toronto, Ont., is lead architect for Prominare Designer and Prominare Validator as well as the new IBM Universal Resource Editor. He has been involved with OS/2 since 1988. He has a degree in architecture from the University of Waterloo and can be reached on CompuServe at 70363,1175 or via the Internet at msmith@prominare.com.

Resources:

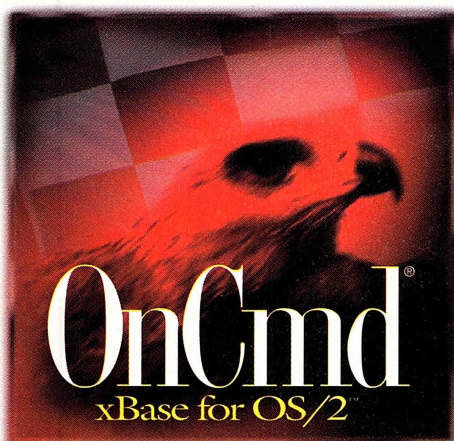
You can download DBCS.exe from these electronic sources:

CompuServe's OS2AVEN forum (OS/2 Magazine Section).

File area 11 on the IBM PCC BBS, (919) 517-0001, OS/2 Tools section on the OS/2 BBS for IBM TALKLink customers.

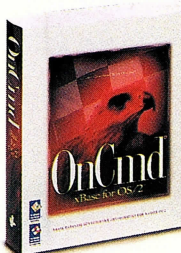
You can also FTP to the site address prominare.com and log in as anonymous. The source is located in the `/pub/prominare/guicornercodecache` subdirectory.

Also check out the GUI Corner home page for the article on the Internet at www.prominare.com/prominare/vol3num4.article.html.



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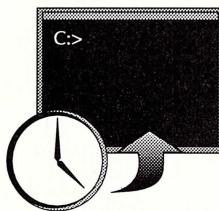
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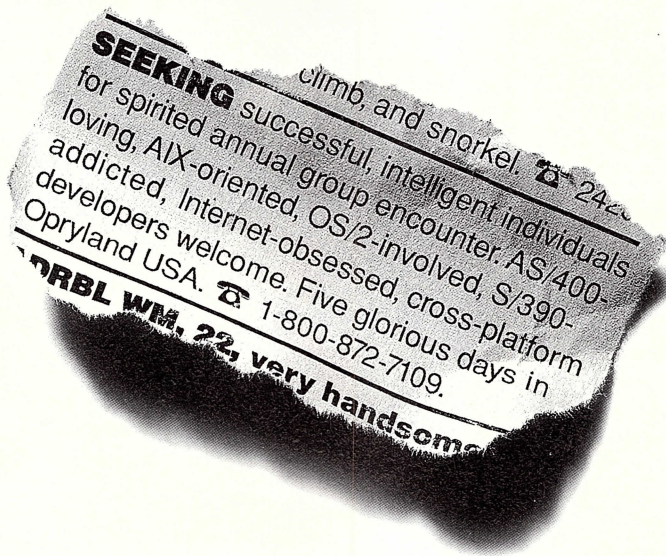


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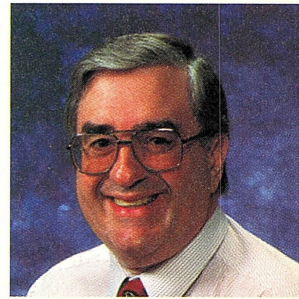


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IBM's Workstation Interactive Test Tool

BY GUY SCHARF



You're programming your great OS/2 application, and it's beginning to work properly. You test it a few times, and it holds up. But will it still work if you try the same thing 1,000 times, with different timing or a different sequence of events? When you make a minor change, do you retest all of the previously tested functions to make sure nothing broke? Not many developers can perform extensive testing without automated aids. Hordes of outside testers help, but you probably won't be able to repeat their tests in the lab.

Enter automated testing tools. Several types of testing tools are available today. Coverage tools try to ensure that all logic paths within your program have been executed. Regression testing tools allow you to test portions of your program extensively, with a capture-and-playback approach in which you capture an interactive session and later play the session back to check if the same results are produced.

The Workstation Interactive Test Tool (WITT) is IBM's automated function and regression test tool for OS/2. Not only will WITT test OS/2 Presentation Manager and text sessions, it will also test host sessions connected to MVS, VM, and OS/400 mainframes. You can record and playback Teleprocessing Network Simulator (TPNS) sessions, and WITT supports Communications Manager/2, CICS OS/2, MicroFocus COBOL, and Easel applications.

I did examine and test version 2.2.2 of Interactive Test Tool under OS/2 Warp Connect on a workstation, but I didn't test host connections.

Installation

Installation is straightforward. Two

Will your OS/2 application still work if you try the same thing 1,000 times, with different timing or a different sequence of events?

disks comprise WITT itself; another two disks contain demo files and documentation. If you have a MVS/TSO host, the manual tells you how to download WITT using the **RECEIVE** command.

The **WITT** folder created contains two *readme* files, online documentation in *.inf* format, and online copies of the manuals in BookManager format, as well as a tutorial and the WITT program icon itself. Complete installation requires 6MB of disk space. Minimum memory is documented as 12MB.

Documentation

WITT ships with two manuals: a 184-page User's Guide and a 171-page Command Reference. Both manuals can also be read online using the supplied **READIBM** program.

The User's Guide has a tutorial chapter that walks you through the process

of creating a WITT project, recording a session, and playing it back. The printed tutorial requires a host connection. If you are testing a PM or text mode application without a host connection, use the online tutorial instead. The online tutorial takes you through the same steps for testing an OS/2 application without a host connection.

I found both manuals clearly written. The User's Guide includes examples of how to extend WITT to do such things as repetitive stress testing as well as using WITT on a LAN. The Command Reference explains each command, describes return codes, and gives examples of the command's use. Two *readme* files, installed with WITT, describe a few additional commands not documented in the printed manuals.

Using WITT

I found it easy to set up a simple test using WITT. After starting it, the first step is to create a **Project**. Open the project and select **File** and then **New** to create a **Test-Case Group**. A dialog asks you for the name of the group and the name of the program to run. If you supply a program name, the program will be started and recording of the session begins. WITT records your interactions with the program. When you want to save a screen for later comparison, switch to the **Record** window and insert a **SAVE-SCREEN** command in the script that is being created. When your test case is complete, switch back to the **Record** window and select **File**, **Save**, and then exit.

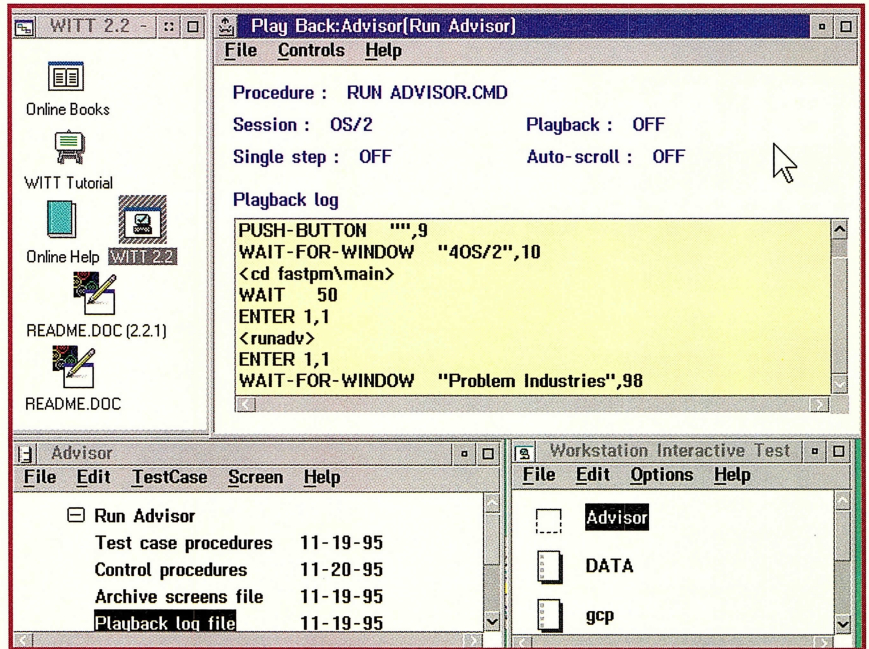
The script you've just created is a **REXX** command file. The commands replicate the functions that you performed while recording the script

using some of the 60+ commands in the WITT test-case command language. You'll need to edit the test cases to add more capability and will become familiar with many of these commands. Listing 1 shows a typical test-case procedure.

You can now play back the script you've just recorded, but you'll need to know more about how WITT operates to compare results and construct test scenarios. Each test-case group has several different types of files associated with it. Test-case procedures hold test cases that are constructed by recording or editing. Control procedures are REXX programs used for running WITT in unattended mode. A *Current screens* file holds all of the screen images captured by a test case and an *Archive screens* file holds the screen images to which current screens are compared. A *Mark screens* file describes areas of the screens not to be compared. This file is useful for masking out date, time, or other areas that normally change. *Field definition* files define the relative position of entry fields, so that you can change the screen layout without having to change the test procedure itself. Several other file types are used for logs, reports, BookMaster script files, and TPNS script files. Only a *test-case procedures* file is required and is created automatically when a script is recorded. All other file types are optional.

Once you have created the test-case procedure, your next step is to play it back. Playing a test-case procedure creates a *Current screens* file. You can examine this file and edit and rerun the script, until the script executes as expected. Once you have a *Current screens* file that you wish to use as the basis for future comparisons, ask WITT to create an *Archive screens* file from it.

The test-case procedure that was recorded automatically doesn't compare the screens. You'll need to add a **COMPARE** command to perform the comparison. This command compares all screens in the *Current screens* file with the equivalent screen in the *Archive screens* file. You can place the **COMPARE** command in the test-case procedure itself, or you might want to write a control procedure to manage the playing of test cases and to compare the screens.



IBM Workstation Interactive Test Tool (WITT).

Listing 2 shows a control procedure that randomly runs one of five test cases and then compares the screens. When a screen doesn't match, the mismatch is written to a log file. Control procedures are written in REXX. In this example, only the **PLAYBACK** and **COMPARE** commands are WITT commands.

When recording a script, WITT inserts **WAIT** commands to reflect delays between your actions. You can edit or remove these commands to change the timing of events. Or you can tell WITT to ignore the **WAIT** commands and insert a fixed delay between all commands.

WITT supports most OS/2 controls, including the notebook, container, slider, value set, and MMPM/2 circular slider. The commands allow you to perform the common operations such as entering text in a field, moving a slider, and double-clicking on a listbox entry. You can also retrieve the contents of an entry field or a window title, obtain all of the text strings in a window, or read all of the strings in a listbox.

WITT has features that specifically support host connections, such as how the screen responds to a scroll prompt and a way to save a screen showing protected and unprotected areas.

I used WITT in an attempt to identify an intermittent failure. I wrote one test case that started a background server. I then created two test cases for the main applications and wrote a control procedure to run them randomly; I ran thousands of tests successfully. In another test I used WITT to test Golden CommPass—another 32-bit application. I was able to display and test many dialogs and control types successfully. WITT seemed to work better with a 32-bit OS/2 application than with a 16-bit OS/2 application with an MDI interface. I had problems with menu selections and mouse positioning with the 16-bit application.

Warts and blemishes

WITT seems to be designed to test a predictable application environment. You can wait for a specific window to appear or for a specific string to be displayed. If you have an application that responds to random events, which can't be simulated well, more complex programming is required. For example, when using WITT to test a telecommunications application, detecting error dialogs or messages caused by communications problems is laborious. One approach is to write a loop that periodically determines which window was active and then examines the window

Listing 1: Test-case procedure.

```
/* Workstation Interactive Test Tool --- Test Case Procedure. */
'START-OS/2-PROGRAM "d:\fastpm\main\fast.exe",1,d:\fastpm\main'
'WAIT 1781'
'PUSH-BUTTON "OK"'
'WAIT 328'
'WINDOW-SELECT "Select Industry",1,1'
'LISTBOX-SELECT "General Industries",1'
'WAIT 387'
'PUSH-BUTTON "OK"'
'WAIT-FOR-WINDOW "FAST/PM",1,1,10'
'WAIT 387'
'MENU-SELECT "Programs"'
'MENU-SELECT "Programs", "History"
....
'SYSMENU-SELECT "Close Alt+F4"'
'WAIT 428'
'ENTER'
'WAIT-FOR-WINDOW "Save Historical Data",1,1,10'
'WAIT 406'
'PUSH-BUTTON "Discard"'
```

completely locking up and requiring a cold boot. In fairness, the second system was a fully loaded development system and not a typical test system.

Similar to many IBM products, WITT has a section on a CompuServe forum. I reviewed the WITT section of the SOFSOL forum and found very few messages posted over the last year. Marketing questions were sometimes answered; but I saw no answers to technical questions posted on the forum. The library has had no files uploaded since the product announcements of April 1994. I didn't find WITT APARs listed in any of the APAR files on CompuServe. IBM's InfoMarket Search tool for the Internet found only one marketing reference to WITT in an IBM file and no references in Usenet newsgroups or World Wide Web pages. I spoke with IBM technical support and they were helpful.

Summary

Regression testing tools are important aids in developing a quality product. WITT is one of a handful of such tools available for OS/2. I found it more reliable with 32-bit than with 16-bit applications. If you need to test OS/2 applications, WITT is worth checking out. I recommend evaluating it in your environment and satisfying yourself that adequate technical support is available. **OS/2**

Guy Scharf is president of Software Architects Inc., a software development firm specializing in developing OS/2 Presentation Manager applications for vendors and business. He can be reached by email at guy@swarc.com.

Listing 2: Control procedure.

```
/* Workstation Interactive Test Tool Control Procedure */
/* Run Advisor forever */
i = 0

'REPORT-FILE FILE(STRESS)'
project='Advisor'
group.1='Run Advisor A'
group.2='Run Advisor B'
group.3='RunFast'
group.4='Run Advisor C'
group.5='Run Advisor D'
numgroups = 5
LOOP:
  i = i + 1
  index = random(1,numgroups)
  call lineout "advisor.log", date() time(),
    'Starting test number' i project group.index
  'PLAYBACK PROJECT('project') GROUP('group.index')'
  'COMPARE DELETETEMATCH'
  if rc \= 0 then call out
  signal loop
OUT:
  call lineout "advisor.log", date() time(),
    'Screen mismatch error in this test'
  return
```

to find out what it represented and how the test should proceed. An event-driven mechanism would be useful for applications of this type.

WITT's user interface is an older, application-centric style, which does not exploit the **Workplace Shell**. It's menu driven and doesn't use the right mouse button for **context** menus. While most of WITT's windows are resizable, the controls within the windows are poorly resized. For example,

listboxes are resized horizontally but not vertically.

WITT provides no specific support for the client/server environment. While you can run WITT on multiple clients and a server, no coordination or scheduling mechanism is provided.

I tested WITT on two machines, both running OS/2 Warp Connect. WITT ran fine on a ThinkPad, but trying to record a session on the other system often resulted in the system

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System Desktop Master

System Commander, Desktop Observatory, and BackMaster.

BY BRIAN PROFFITT

System Commander 2.23

So much fuss has been made over what operating system people select that a significant point is overlooked: There is no single best personal computer operating system. Wait! Before I'm burned at the stake for heresy, consider the fact that some Windows and DOS programs exist that don't run under OS/2. I'm sorry, but it's true. There are also some fine UNIX programs that OS/2 users can only gaze at from afar. Of course, the Windows and UNIX lovers can only dream about all the advantages of OS/2.

The point is, in this world of 1.2 gigabyte disk drives under \$300, why assume you can only run *one* operating system? Sure, even OS/2's Boot Manager limits the number of operating systems it can manage, but with System Commander all practical limits disappear.

Amazingly easy

I began exploring System Commander with hesitance. I had visions of repartitioning, formatting, and restoring or reinstalling hundreds of megabytes to get the system working. While some of that might be necessary for more exotic configurations, System Commander detected and worked with my existing partitions flawlessly. (Just in case, make sure you have a complete backup before starting the installation.) During installation, System Commander copied itself on to my existing c: partition (without disturbing what was already there), and changed the disk's Master Boot Record to point to System

Commander rather than Boot Manager. The old Master Boot Record was saved for easy uninstall.

From that point on, booting the system caused System Commander to take control. The program scans all partitions for operating systems, displays a menu of those found, and lets you select the system of your choice. Imagine having DOS 3.1 (for compatibility with the old standbys), DOS 7, Windows 3.11, Windows 95, Windows NT, OS/2 2.1, OS/2 Warp, NetWare, and UNIX all available. You simply choose the best platform for whatever task is currently at hand.

For these multiple platform setups, System Commander provides a way to install up to 32 different operating systems (that support the FAT file system) and allows them to reside in a single primary partition. Using this technique, you could theoretically have more than 100 operating systems on your computer at one time.

Glee or flee

For most people, OS/2's Boot Manager provides enough flexibility. But if operating system limitations are causing you problems, System Commander is a great way to expand your options.

Desktop Observatory 4.02

As OS/2 becomes the standard platform for more corporations, IS departments continue to search for quality networked desktop management and security packages. For lack of a better title, I'll refer to Desktop Observatory

as a system administration tool. This product incorporates desktop customization, backup, and reproduction with extensive security features.

Both client and server components

Two main types of security are included in this product. First, is client security, which controls the desktop that the user sees and interacts with before logging on to the network. Because this information must be stored on the client machine, it's system-specific rather than user-specific. Desktop Observatory makes it easy to put a **logon** icon on the desktop, either alone or as part of a limited set of

A Family of Products

Desktop Observatory is at the top of a three-product tier from Pinnacle Technology. The others are:

Kid Proof/2 allows you to force logon before use of the computer. Based on their logon, users get a desktop designed specifically for them. You can restrict icons from being moved or deleted, prevent inadvertent drops on the shredder or access to programs inappropriate for some users.

Desktop Commander builds on that base and adds network support. Users see their customized desktop, no matter which machine they use to logon to the network. Desktop Commander includes all of the functions of Desktop Observatory except for the extensive security features.

available functions, and to assign a script to logon and logoff operations. Logon is transparent to LAN Server or NetWare, but you'll have to write a REXX script to handle logon to other networks.

Once a user logs on, the second type of security comes into play, the server. The server checks the configuration information for that user and presents the desktop that is specifically set up for that person—no matter which system on the network an individual is using. You can require this logon on stand-alone systems as well, but individual desktop setups must be stored on the client system. By keeping the desktop configurations on the server, rolling out new applications becomes much easier. The administrator can add the new program's icon to the desktops stored on the server, allowing users to automatically see it on their local machines the next time they logon. Distributed installation of Desktop Observatory itself is also supported.

If you let users make changes to their desktop configurations, you can specify that the new setup be saved when they logoff. (You will have to grant the user write privileges to the setup directory.) To enhance security, you can instruct Desktop Observatory to automatically execute a logoff after a period of inactivity.

Low-level object security

Desktop Observatory literally takes control of your system, loading itself first and then running the Workplace Shell within its control. As a result, it maintains a very tight control of the system. For example, you can require a different password to open each object on the desktop, set expiration periods for passwords, and set the number of incorrect passwords the system will allow before locking up. You can also disable the pop-up menus of desktop objects, thus removing access to their settings notebooks and the other manipulation options found in the pop-up menus. These entries can be

removed from the pop-up menu of the desktop itself, leaving just the **Refresh**, **Help**, and **Shutdown** entries.

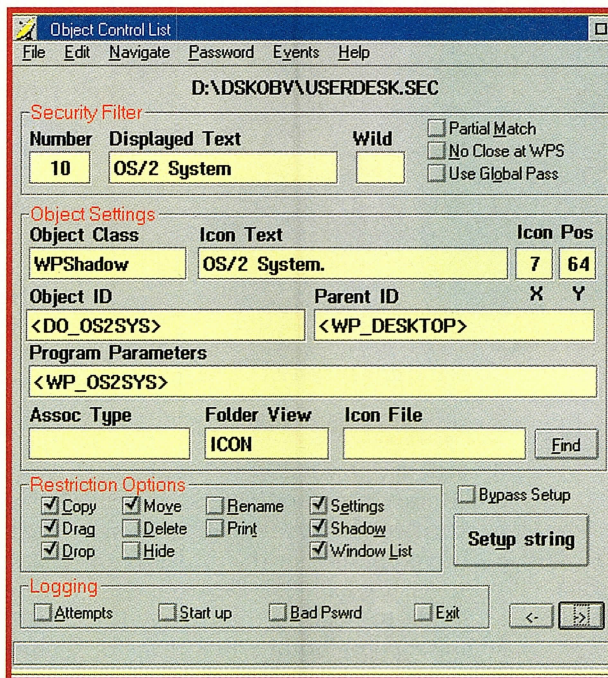


Figure 1: The Object Control List allows detailed management of each desktop object.

For each object, you can specify a separate program to be executed whenever the object is opened and another to execute when it's closed. In Figure 1, you see the dialog that Desktop Observatory uses to manage the security of individual desktop objects. You can define new desktop objects here, rather than going through templates or copy/shadow operations. Assigning all the resource information that you would use in a SysCreateObject statement is possible, too. (In a secured system, Desktop Observatory can reject SysCreateObject calls.)

The administrator specifically controls the user's ability to copy, move, delete, hide, shadow, drag, drop, rename, print, and access the settings notebook for an object. Desktop Observatory can be instructed to keep a log of each time an object is opened or closed, as well as instances of users entering incorrect passwords. A separate log utility makes it easy to view, manipulate, and create reports from the logs created.

The object identification is based on the text in the object's window

title bar. You might not be able to specify the exact text when working with text files that are loaded into an editor and that possibly have different window title text, indicating that a file is loading. Object Desktop allows you to type "?" as a wildcard to indicate that any window title, which includes the specified text, comes under the security specified. For example, adding a page to the Object Control List, with the Displayed Text field set to "?config.sys", allows you to control the loading of that file into a text editor.

We should note that the documentation wasn't updated from version 4.0 to 4.02 and not all the changes made it into the README file. For example, the manual includes a tip that tells you not to type the "?" wildcard on an object while the Partial Match box is checked. And yet, Pinnacle's technical support told me to do exactly this action, blaming outdated documentation when I called to find out why my config.sys file wasn't being correctly secured. Because the title text is case sensitive, and depending on your editor and technique for loading files, you may need to secure ?CONFIG.SYS. HPFS users who like to dress up their directory listings can add a third object to the control list like ?Config.sys.

Overall system security

If you have IBM's DCE, you can request a DCE-enabled version and tell Desktop Observatory in the Master Control Panel to interface with DCE's Global Security Services. The Master Control Panel, shown in Figure 2, is used for system-level management. For example, you can disable <Ctrl+Alt+Del> to prevent user reboot. Another interesting option on the Master Control Panel is the mini-icon window (shown in Figure 3). This window contains a small icon for each active program that isn't secured to be invisible in the window list, so it's pos-

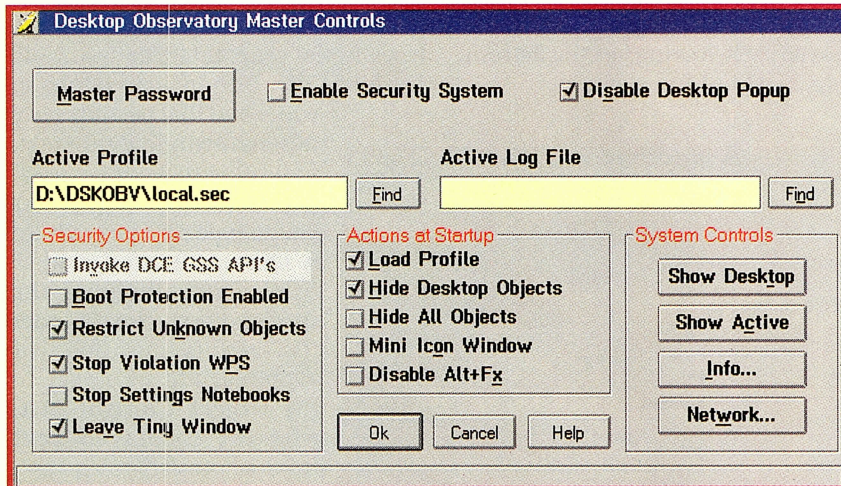


Figure 2: The Master Control Panel allows management of overall system function.

sible to switch to any program simply by clicking on its icon.

Other tips

Make sure you see the README file before starting installation, particularly if you are upgrading from an earlier version or are running Kid Proof/2.

A file encryption utility is included that allows very tight security on specific files. It uses the Blowfish encryption algorithm, which is based on the 56-character case-sensitive encryption keys.

Unless you are running a version of OS/2 earlier than OS/2 Warp 3, Desktop Observatory also installs a Finder utility. This program takes a snapshot of the objects currently on your desktop and creates a notebook similar to the Object Control List but easier to use. For example, the list has named tabs allowing you to move quickly to the page containing any object you want to see. From this notebook, you are able to create new security setting files.

Glee or flee

Desktop Observatory is not an end-user product. Entry level for this product starts at network administrators and continues up the ranks to IS directors. Those looking to secure and standardize multiple systems will find this a useful product, even though the documentation isn't as good as it should be. Also, if you choose this product, plan on spending time with Pinnacle technical support.

BackMaster 2.0

Because support has been limited to IDE floppy and parallel tape drives, BackMaster has had the image of being a backup product for the casual user. With version 2.0, MSR Development attempts to beef-up that image by adding support for three higher-speed IDE adapters, three HP Powertape and SureStore SCSI tape drives, four Tandberg SCSI drives, and two HP PowerDat drives, along with support for LAN-Server, LANtastic, and OS/2 Warp Connect Peer-to-Peer services.

Getting started

Setting up BackMaster is more complex than SCSI- and EIDE-based products, such as BackAgain/2, because the IDE controller doesn't provide the program with the same information about the drive attached to it. Still, it isn't overly difficult.

Backups are based on file selection sets, which are ASCII text files containing commands that tell BackMaster which files to save. The installation program created default file selection sets for my two FAT partitions, *c:* and *d:*, but ignored my two HPFS partitions, *e:* and *f:*. You can create new file selection sets with a text editor or by using BackMaster's interface, which is similar to the Workplace Shell Drive objects. Version 2.0 adds the ability to backup more than one partition in a single file selection set.

In conjunction with the well-known drive tree view, you can add file name and file date filters to specifically include or exclude files either globally or within a specific folder (typing the "*" and "?" wildcards as needed). You might be surprised to see that the extended attribute files, *wproot.sf* and *eadata.sf*, don't appear. That's because BackMaster doesn't backup these files; instead, it stores the Extended Attribute (EA) information for each file on the tape and rebuilds the EA files during a restore. EAs aren't checked during verify operations.

Once you create a file selection set, drop it onto the BackMaster icon to start a backup. You will be unable, however, to drop other objects such as Workplace Shell folders onto BackMaster to save them to tape—a practice BackAgain/2 allows. BackMaster also requires more memory, with an 8MB minimum. This is probably not a big problem, because systems small enough to have less than 8MB are unlikely to use tape backup. Still, the extra 2MB required increases swapping

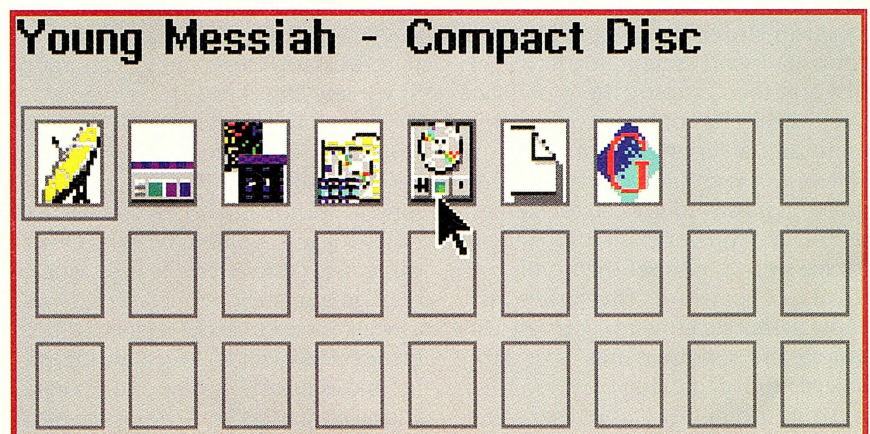


Figure 3: The Mini-Icon Window allows easy switching between programs.

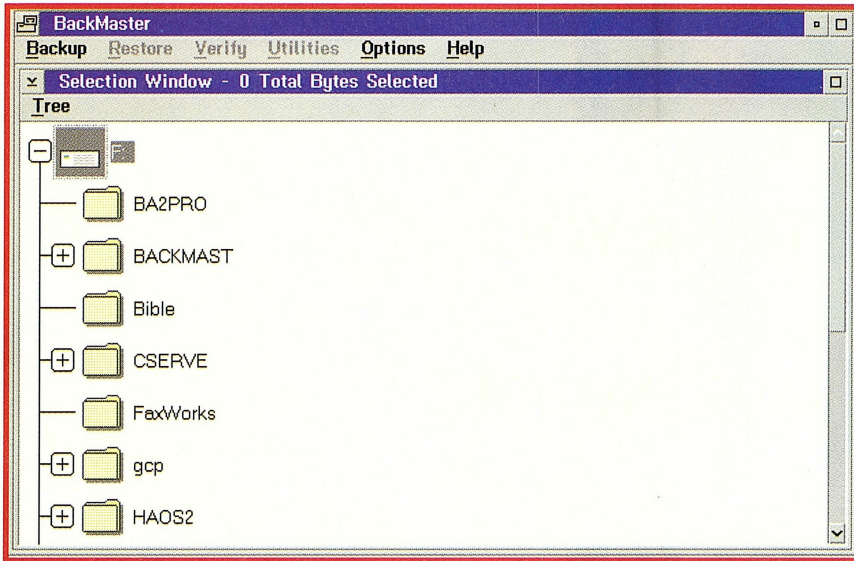


Figure 4: BackMaster uses a variation of the familiar drive tree.

on low-memory systems and has more impact on overall system performance.

Up and running

BackMaster is a native OS/2 program and behaves itself. The program's thread priorities aren't adjustable, but I found the default values to be good. BackMaster has very little effect on the performance of other programs running in the foreground. In a busy environment, file transfer to tape slows down. In a production environment, however, other programs frequently need more priority than backup.

IDE tape drives are more sensitive to system load because they don't have the SCSI busmaster capabilities. Version 2.0 adds some SCSI support, but it's still quite limited. Version 2.0 also adds support for the Ditto Dash Accelerator, FC-20, and Conner CTC high-speed IDE adapters. Testing was done using the QIC 3010 QIC-WIDE cartridges in an Iomega Ditto 1700 IDE tape drive attached to the IDE controller onboard a Pentium-90 Triton motherboard. At this configuration, BackMaster's maximum throughput is 500 kilobits per second (kbps). BackMaster also supports faster transfer using the high-speed IDE cards, but after several calls to MSR technical support, we were unable to use BackMaster successfully with QIC-3020 wide cartridges in the Iomega Ditto drive attached to an Iomega Ditto Dash accelerator card.

You can specify a one-time unattended backup, but you'll have no facility for establishing a regular weekly or daily unattended backup. A regular unattended backup has to be created using some separate scheduling package and the command line version of BackMaster. Also, while you can select or deselect compression, no method exists for tuning the amount of compression to balance backup speed and tape usage, such as BackAgain/2 allows.

MSR includes a program to simplify creation of recovery disks. If you replace your hard disk completely, the recovery disks allow you to boot OS/2, use FORMAT and FDISK to prepare the disk, and also load the necessary tape device drivers and a character-based restore program.

Restore allows you to select between overwriting all or none of the existing files, prompt the user for each existing file, or overwrite those if the file on tape is newer than the version on disk.

I'd like to see MSR add some tape maintenance abilities, such as the ability to purge a data set from the end of a tape, similar to what BackupWiz offers. As the product stands now, you have to erase all or none of the tape. Note that this product is not for a general-purpose backup. It's limited to tape only and provides no way to backup to a floppy.

Glee or flee

If your tape drive is supported by BackAgain/2, then its user interface, flexibility, and speed make it a better choice. If your drive isn't supported by BackAgain/2, BackMaster is quite an acceptable alternative. If you haven't purchased a tape drive yet, I recommend you go the SCSI route for superior speed, capacity, and multitasking.

You should confirm support for your tape drive and cartridges with MSR Development before purchasing BackMaster. **OS/2**

Brian Proffitt was part of IBM's OS/2 team and left IBM to become the director of PC Week's Corporate Labs. He is now the president of Visionary Research, senior contributing editor for OS/2 Magazine, and solutions advisor to PC Magazine. E-mail him at 75300.1466@compuserve.com.

Resources:

System Commander 2.23 (\$99.95, site license available)

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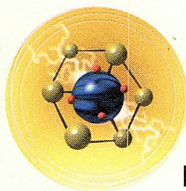
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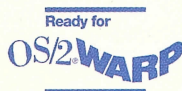
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Pick a Compiler

C/C++ Tools from Borland, IBM, MetaWare, and Watcom. BY DAVID MOSKOWITZ

So you've decided to write native OS/2 applications in C or C++. Which compiler should you choose? Let's look at four OS/2 compilers now available in order to help you pick the best C++ compiler to meet your needs, from Borland, IBM, MetaWare, and Watcom. Each compiler has its advantages and disadvantages, and appears to be targeted at slightly different market segments with different needs.

Making the choice

It isn't merely a matter of describing the compilers and the intended market segments, because there isn't a clear line of demarcation between the seg-

ments or the compilers—they overlap. But depending upon the amount of system resources you have available, it's possible that you might not have much choice (Table 1). For example, if you don't have about 200MB of available disk space, then the IBM offering might not be an option.

If resources aren't a problem, you still might have limited choices depending upon the features you expect in the compiler. Consider the following questions:

- Do you want an Integrated Development Environment (IDE—a confusing acronym if used out of context since it can also refer to Integrated

Device Electronics disk drives)? The IDE is a control center that provides a single interface to edit, compile, build, and debug applications. The Borland, IBM, and Watcom compilers include an IDE. The MetaWare compiler does not.

- Will you develop applications for more than one platform? Each compiler provides some degree of platform flexibility. The Watcom compiler is the only one to provide in-the-box multiplatform support. To get multiplatform support from Borland or MetaWare, you need to purchase a compiler for the appropriate environment. Currently, IBM's compiler only supports OS/2. (By the time you read this, the 32-bit Windows compiler should be available.)
- What type of technical support do you expect from the vendor? I didn't find much to differentiate the vendors. Each vendor provides a technical support phone line (not toll free). Borland, IBM, and Watcom provide active online support on CompuServe. For immediate help, online support might take too long.

Table 1: Compiler resources.

	Borland	IBM	MetaWare	Watcom
Hard disk space required (1)	70	190	70(2)	380(3)
Minimum memory (4)	8	16	8	12
Preferred memory (5)	16+	32(6)	16+	20+
Formats supplied	CD or floppy	CD	floppy	CD or floppy

NOTES:

1. This includes space for the compiler and allows 10 to 20MB for personal tools and programs.
2. The base MetaWare compiler takes about 40MB of disk space. To that, add another 20MB or so for the OS/2 2.1 Toolkit.
3. This figure includes the installation of every cross-platform option and assumes heavy Windows programming. If you intend to limit your work to OS/2 only, 120MB of hard disk space is required.
4. Minimum memory is the amount of RAM required to compile our test programs without allowing time to eat a meal. The MetaWare compiler works with as little as 4MB RAM, however, this configuration isn't recommended.
5. Preferred memory is the amount of memory that provides reasonable performance while using the compiler.
6. IBM recommends 24MB, if you intend to use the Visual Builder that comes with the compiler. We found that at least 32MB was needed to get the acceptable performance; 64MB was even better. One fact of C (or C++) programmer life: more RAM equals better performance. Trying to run the Visual Builder in 24MB is somewhat like trying to run OS/2 Warp in 8MB—it works, but after a while the wait time becomes excessive. For developers, however, we believe adding an additional 8MB makes a radical difference in performance. The IBM Visual Builder raises the developer memory entry point from 16MB to 32MB.

If you intend to use the compiler on a laptop, I'd suggest nothing less than 24MB RAM. C++ compilers tend to be resource hungry. Adding memory to your laptop will extend battery life because the system will do less swapping.

Borland's C++ 2.0 for OS/2

Borland shipped two different editions of its compiler. Which one you have depends upon when your dealer received inventory. The current shipping version includes the IBM SOMObject Toolkit and has a red swatch of color on the CD-ROM. Older versions don't include the Toolkit or the red swatch.

According to Borland representatives, the only difference is the presence of the IBM Toolkit. However, we found different file dates and some differences in file sizes between the two versions. Performance between the two

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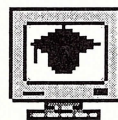
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PICK A COMPILER, *cont'd from p. 63*

appears to be identical, though we didn't spend much time trying to ascertain the differences.

Borland's compiler includes their Object Windows Library (OWL) that is supposed to be compatible with the Windows version. OWL is an object-oriented class library that encapsulates the OS/2 Application Programming Interfaces (API). Once the programmer learns the class library the task of creating programs for OS/2 is simplified. (See Class Warfare sidebar for a brief comparison of OWL and IBM's Open Class.)

The learning curve, to become really familiar with OWL, might be longer than many people are willing to bear. This fact isn't something peculiar to the Borland product. One of the hallmarks of object-oriented programming (in any language from any vendor) is re-use. In this case, you can re-use the Borland-supplied classes to write PM applications, and the programs will usually have fewer lines of code than the same program written from scratch (without re-use) in pure C.

There is a Catch-22—you can't reuse what you can't find (or don't know exists). Based upon work with our clients, it takes a significant amount of time (at least three months to a year,

we'd estimate) to learn the nuances of OWL. It can take even longer if you are also trying to learn object-oriented programming at the same time.

Figure 1 shows the Borland C++ compiler's IDE. Within this environment, you can group the various files that make up an application into projects. You can also use your own text editor with the Borland IDE, although this option isn't nearly as convenient as using the built in editor.

Borland was the first company to provide color highlighting (comments, syntax, and so on) inside their IDE. IBM and Watcom also include this capability. The IDE provides for program creating, compile and link, as well as debugging.

You work on an application by starting the IDE and opening (or creating) a pro-

ject. You write programs, compile, and debug from within this environment. What can be challenging is integrating your work with third-party tools such as source code version control systems. (Version control tools track changes to the project source files as you work on them.)

For example, with the Borland IDE I had to check-out source files for a project before I tried to work on them in the IDE. In contrast, accessing files from a version control system in BRIEF (a programmer's editor from Borland) is a transparent process. If I open a file, a BRIEF macro retrieves the file from the version control system. When I finish editing the file, BRIEF automatically prompts for a change in documentation and checks it into the version control system.

I haven't found a way to get the same degree of automation in Borland's IDE, except by using BRIEF as the IDE editor. However, since I can do everything except debug the applica-

Class Warfare: Open Class vs. OWL

Both Borland and IBM provide their own home-grown class libraries with their OS/2 compilers. Borland's class library OWL (Object Windows Library) includes about 200 classes that simplify building OS/2 Presentation Manager applications. However, it's Microsoft Windows heritage that shows. For example, a TXGDI-class GDI (Graphical Data Interface) is the Windows graphics component. OS/2 provides a similar set of functions called GPI (Graphical Programming Interface). While the names reflect the original Windows implementation, the functions still map to OS/2's GPI.

Since IBM is actively pushing objects everywhere, let's hope they practice what they preach—and they do. IBM's Open Class library is excellent and, according to IBM, will soon be coming to other platforms, including AIX and various flavors of Windows. It's everything Microsoft's foundation Class library is and more.

IBM's Open Class is more than a UI class library. It also includes many classes similar to the Rogue Wave Tools.h++ (included with the Metaware compiler) and other compilers. For example, classes exist for strings, complex numbers, collections, and so on.

OWL focuses on the user interface. Borland provides classes for complex mathematics, I/O streams, and other functions as separate libraries; IBM bundles this capability with Open Class. This means that comparisons based purely on the number of functions will be misleading. Borland doesn't include specific OWL support for threads; Open Class does. In addition, Open Class also includes support for toolbar (button bar) that supports fly-over help (Figure 2).

Open Class includes two areas that are not part of OWL (or any other compiler-supplied class library): multimedia and database access (IBM calls it Database Access Builder). This version of Open Class limits database access to IBM's own DB/2. According to IBM, future versions will include support for other database servers.

Put it together and IBM's Open Class is the more complete of the two libraries. However, its size could be intimidating to the novice. If you want to learn a reasonably complete user interface class library, look for a deal on the Borland compiler. (I've seen it advertised at various times for around \$100.) If you are comfortable with C++ or need the additional functionality, then get the IBM compiler.

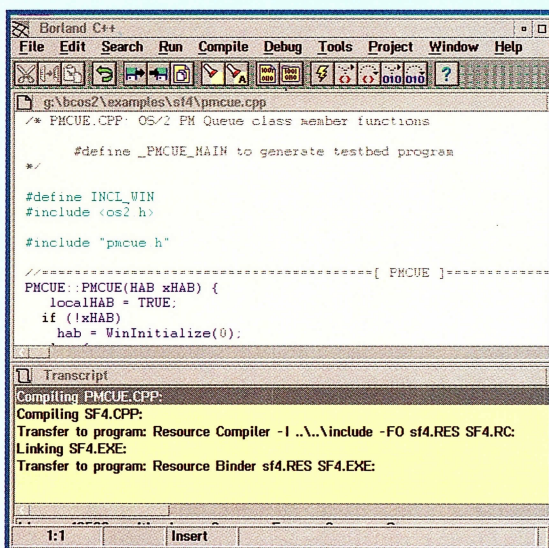


Figure 1: Borland's Integrated Development Environment.

tion from BRIEF, this defeats the purpose for using the IDE. This problem might be alleviated if the compiler vendors provided a link from their IDE to REXX.

The Borland compiler is easy to install and configure. It takes the least amount of disk space of the four compilers and is the fastest compiler in the group. However, it works in small portable systems with 8MB RAM.

If you have written programs for Microsoft Windows using Borland's OWL, then you should consider their OS/2 compiler. If you want a fast, relatively easy-to-use compiler to learn about C++ (C too), then it's also worth considering.

I found some problems with the debugger. With large executables and some complex conditional code, the debugger would occasionally get lost (as if we'd turned on optimizations). In addition, I had one instance where the debugger generated a SYS3175 error.

Given how closely IBM and Borland worked to create early versions of this compiler, it could use a revision to add support for IBM's Open Class library. Many developers would be absolutely delighted if Borland updated BRIEF.

IBM Visual Age C++ 3.0

If you're into object-oriented programming for OS/2, Visual Age C++ is the compiler to get. However, because of its size, the learning curve associated with using IBM's Open Class library can be very steep. One of the problems is the documentation. IBM ships the compiler in two different packages. Both packages provide extensive online documentation; one includes complete paper documentation, the other doesn't. I don't mind online documentation, and, for class libraries, a good hyper-text online reference can make understanding the relationships and dependencies easier than a paper ver-

sion. However, I also want a complete set of manuals.

IBM provides a special editor with its compiler called LPEX. It provides the color-coded syntax checking that has been part of Borland's IDE offerings for years. In addition, LPEX spots some syntax errors that would ordinarily wait until you compile the application (it's not a lint replacement). LPEX command structure is similar to EPM and can be modified with REXX.

The IBM compiler also includes a Visual Builder that can help simplify application creation. Visual Age for

Smalltalk, IBM's original GUI-based development tool in this product family, recognizes the project definitions created by the builder that is included with IBM's C++ product. In fact, it's the same builder. The difference is the back-end code generator. This generator makes cross-language development easier. However, the capability has a price. To use the Visual Builder, IBM recommends 24MB RAM. (I've found that to be very optimistic. I suggest at least 32MB RAM.)

The problem is that the Visual Builder uses lots of memory, which (on a 24MB system) starts to create large swap files (60MB with one sample). Since disk access is significantly slower than memory, as you add more objects to your builder canvas, performance decreases. Alas, 32MB isn't perfect either. I've used the Visual Build on a system with 64MB RAM with one very large project and still had a 24MB swap file. This component will drive memory sales.

The Visual Builder uses the concept of application assembly versus application construction. You drag application parts (icons represent each part) to a canvas and connect them together to build the application. IBM supplies parts for Presentation Manager features such as multimedia. The package also includes database parts (though, for this review I was limited to working with IBM's own DB/2). Depending upon the application you want to build, it's possible to create a finished working program without writing a single line of C++.

The Builder guides you through the process of defining actions, methods, and events that make up the final working application. (Note: while it might not be necessary to write C++ to use the Builder, you do have to know C++ and the IBM Open Class library to use it.)

There is one problem with the Visual Builder. If you build small applica-

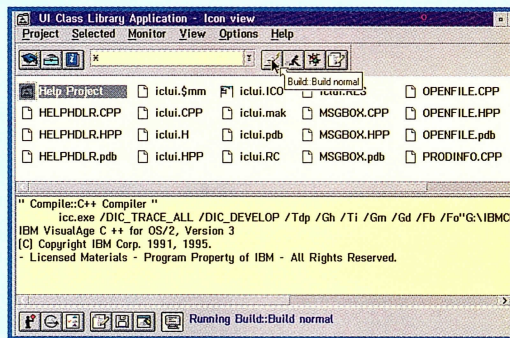


Figure 2: IBM's Integrated Development Environment.

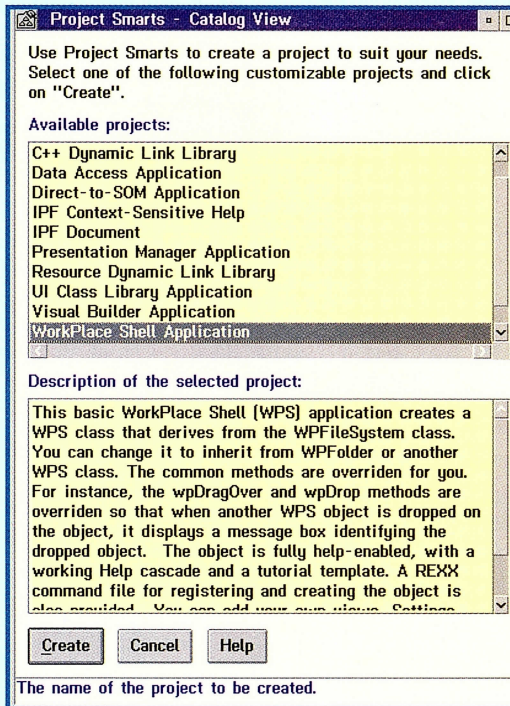


Figure 3: IBM's Project Smarts folder.

tions that use existing PM controls, then the code is manageable; if you build large applications, or use your own controls, the resulting code is far from optimal and somewhat difficult to maintain. In addition, the resulting source code produces less than optimal execution because the Visual Builder generates connection classes for programmer supplied objects. The connection classes add overhead. If you make manual changes to the code you can't easily go back to the builder to make changes.

The Visual Builder does have one short-coming that I'd like to see fixed before the next version. It allows you to make connections that get rejected at compile time—you can build application in the Visual Builder that don't compile. If you haven't touched the Visual Builder generated code, it's obvious that you have to go back to the canvas and redo some of your connections. If you changed the code, it's harder to determine if you did something or if it did.

IBM also includes Project Smarts. Projects Smarts builds template applications that allow you to fill in your own code. You can generate code for a variety of different uses including C or C++ Dynamic Link Libraries (DLLs), Information Process Facility (IPF), Presentation Manager applications, Workplace Shell objects, Direct-to-SOM, Visual Builder, and more. Once you've made your selection, Project Smarts prompts for information it needs to generate the code you requested (Figure 3).

Project Smarts creates a folder that is a Workframe/2 object. Workframe/2 is the core of IBM's IDE—object-oriented! An icon in the folder represents each of the project files. Each object has a potentially different set of tools available. If you click the right mouse button, you will see a menu of tools, options, or actions appropriate for the

object. Each folder comes with menus that let you control the entire project.

IBM's approach to an IDE differs from the other compilers reviewed. For the IDE, IBM uses objects (what a concept!), where the other compilers provide an application. If you are used to other IDEs, this one might make you uncomfortable until you get used to it. It supports standard functions including editing (using LPEX), compiler and link, debugging (profile and execution trace analyzer), and class browser.

To test compiler performance, I used part of a client application (about 10,000 lines of code). The IBM compiler was slower than the Watcom and

to make the applications run, I needed to have 2.2MB of DLLs in my libpath. According to IBM, developers can make these libraries available with the applications. However, this option also presents problems. It means I need at least 2 additional disks to accommodate the libraries. Further, as IBM releases different versions of the libraries, users might have problems if they have multiple applications, and each application uses a different version of the libraries.

MetaWare High C/C++ for OS/2 3.32

The MetaWare compiler was the only one packaged and supplied on floppy disks. From this you might conclude that the MetaWare compiler was a bit more spartan than the others—and you'd be correct.

The installation instructions for the High C/C++ compiler are table driven and the most complex of the four compilers. The installation process is relatively simple. (The instructions in the manual are more complex than needed—the problem is the

explanation of the installation process, not the process itself.) It's also the only compiler installation routine that asks for personalization (the last six digits of the disk 1 serial number).

The MetaWare compiler assumes you have your own editor, and it does register an OS/2 Desktop object. If you elect to install Workframe support, it will link into the older Workframe/2 that comes with the IBM C Set++ compiler. I didn't find a way to make it fit with Workframe folders of Visual Age C++. Two calls to MetaWare tech support didn't help either.

The MetaWare compiler doesn't include OS/2 specific class libraries development environment. The compiler is command-line driven—High C/C++ doesn't include an IDE. You

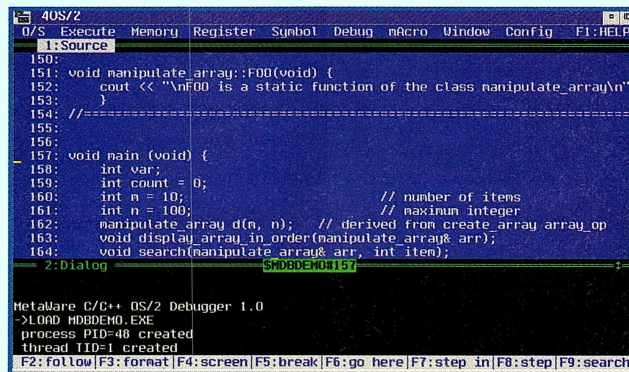


Figure 4: MetaWare's High C debugger.

MetaWare compilers (though not by much). When I tested execution I didn't find much difference between the Watcom, IBM, and MetaWare compilers (the executable from the Borland compiler was about 8% slower). For small test applications with all code in the .exe file, the IBM compiler produced larger executables. I suspect this is because of the way IBM structured its class library. As the test programs got bigger, the executables did not grow by the same percentage. For example, if we multiplied the size of the source code for the program by 10, the executable only increased in size by about 20%.

When I relinked the same applications, using the Open Class executable run-time DLLs, the executable sizes dropped to less than 100K. However,

have to create your own *projects* and *make* files. In short, this compiler is for programmers who like to be close to the metal.

What you get is a robust compiler that takes just about everything you can throw at it—including some extraordinarily large applications (500,000 to a million lines of code). MetaWare includes the Rogue Wave Tools.h++, a collection of standard classes that are not OS/2 or user interface specific (for example, collection, time zone, string, file handling, and more). I've used the Rogue Wave libraries for other applications and find them a worthy addition to my workbench.

The other compilers have some of the classes included in the Rogue Wave tools. Only IBM's Open Class comes close to mapping the Rogue Wave classes. MetaWare could provide support for Open Class, instead they rely on third-party tools (Zinc makes a MetaWare-compatible user-interface class library).

MetaWare's High C++ was the first compiler to include DTS (Direct To SOM). Without this capability, developers would have to define classes for the Workplace Shell (or other SOM-compatible class libraries) twice: once in C++, once in SOM. With DTS, the classes need to be defined once (in C++, you still need a manual SOM step if you create objects in C). Once the objects are defined, a compiler switch generates the necessary SOM interface files. IBM licenses this capability from MetaWare and includes it in Visual Age C++; nobody else has it.

The MetaWare debugger, like the compiler, is character based (Figure 4). It is significantly better than the old CodeView debugger. However, it doesn't provide the same type of visual maps of classes as the other debuggers. The MetaWare debugger can be used to debug a PM application without hang-

ing the computer (something that was almost impossible to do with the old CodeView debugger).

I've spent much time doing character-based development for OS/2 1.x, and I appreciate the 32-bit development tools that integrate with the Presentation Manager and the Workplace Shell. I've come to prefer graphical tools to build graphical applications.

Watcom C/C++ 10.5

If you want a compiler that provides strong support for DOS, Windows, or NetWare Load Modules (NLMS) as well as OS/2, then this compiler is the one to choose. It's the only one that includes in-the-box support for 16-bit application development for both Windows and DOS (you can also use the included DOS extender). The Watcom compiler includes the Microsoft Foundation Classes (16-bit and 32-bit versions of MFC—an update for the Windows 95 version of MFC should be ready by the time you read this article); it doesn't include support for IBM's Open Class (MFC is Windows specific and can't be used for OS/2 development).

The compiler can be hosted on OS/2, Windows NT, Windows 95, and Windows 3.1, and it can generate target code for any platform (provided you installed the necessary compo-

nents). This cross-platform capability comes with a price. If you install the capability to build applications for every possible platform, you will need almost 400MB disk space.

OS/2 support is limited to host and target capability, and Watcom provides the IBM OS/2 2.1 Toolkit. Its support for Windows (all flavors) is much stronger and includes Blue Sky Software Corp.'s Visual Programmer that generates MFC source code.

There is an Integrated Development Environment (IDE)

for each host platform, and only the host platform IDE is installed. The IDE supports complete software development, including program creation and editing, compile and link, debugging, and profiling (Watcom calls profiling, sampling).

If you plan to generate Windows code, you should install the compiler so that it's hosted on Windows. It's apparently a Win32s application that requires more than the Win32s 1.15 support included with OS/2 Warp 3.0 (retail version). Watcom's package also integrates with Intersolv PVCS—a plus since most IDEs don't really understand version control systems.

The Windows side of the package is more complete than the OS/2 side. Watcom does include instructions for dealing with the OS/2 kernel debugger (something the other compilers forget). The IDE looks basically the same in any environment (Figure 5).

In addition, Watcom includes a tool that allows you to combine multiple DLLs into one using a technique called Forwarders. You could, for example, combine two existing DLLs into one to get some performance improvement (essentially what IBM did with OS/2 Warp to produce *pmmerge.dll*). However, by performing this action you do have a slight load-time penalty to pay.

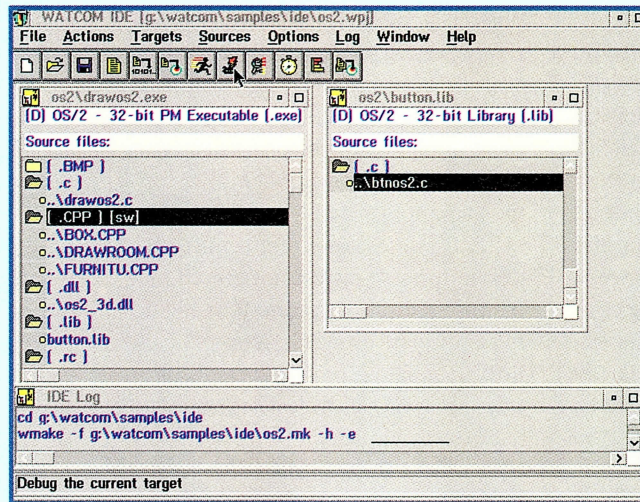


Figure 5: Watcom's OS/2 Integrated Development Environment.

Review

The version of the compiler Watcom sent included online documentation. I would've appreciated complete paper documentation, too. The package also includes Watcom's Infobase on a second CD-ROM. It provides technical support information, samples and patches for previous versions of the Watcom compiler, as well as Watcom's SQL and VX-REXX products.

Watcom built its reputation on solid code and good optimizations. This version fits into that heritage. The code is clean and quick. However, the compiler is not as fast as Borland's and is slightly slower than MetaWare's. The debugger is Presentation Manager based and provides the standard functions. I did have some difficulty tracing user-defined classes, and it took me a few minutes to discover that I had not properly specified the parameters for my own class library.

Summary

One of the key benefits of object-oriented development is re-use. Further, with the trend toward multiplatform support, it would be nice if every vendor included the ability to easily use version control and similar repository tools, such as configuration managers and automated version builders. While you can find a way to add the capability to each product, it would be better if we didn't have to jury-rig something to work. I'd also like to see OS/2 compiler vendors include some run-time code-checking tools (such as bounds checkers) that are appearing in some Windows-based products.

C++ is not an easy language to learn. Mastering object-oriented development is not trivial either. For someone new to either C++ or OOP (object-oriented programming), all four vendors offer minimal tutorials—sufficient to augment other learning vehicles, but not enough to master the language or the paradigm without additional help. Each compiler provides some sample source (even if its from the IBM OS/2

Toolkit), but it might not be sufficient for people who want to learn C++ or object-oriented programming.

Which one to pick? If you used Borland's OWL class library for Windows development, consider its OS/2 compiler. However, the version of OWL included with the OS/2 compiler is down-level from its current shipping of Windows compilers. This could raise some portability issues.

If you want direct-to-SOM support, then the choice is either MetaWare or IBM. Borland's compiler includes the SOMObject's toolkit. While it's not the same thing as direct-to-SOM, it's better than no SOM support at all (Watcom).

If you want a cross-platform tool for OS/2 and Windows (all flavors), get the Watcom compiler. Watcom supplies cross-platform capability in the box. The other vendors require that you purchase a compiler for each platform. You could use separate packages from Borland or MetaWare to get OS/2 and Windows. The Borland Windows compilers aren't the same version as its older OS/2 compilers—slight semantic differences are apparent between the versions, so some manual work is required to create common source code. MetaWare also supports UNIX (separate package), and IBM says it will have a version of Visual Age C++ available for AIX, Windows, and PowerPC.

Want the best code optimizations? Pick either IBM or Watcom, with MetaWare next and then Borland.

Want good laptop support? Pick MetaWare or Borland. Choose the MetaWare compiler if you like working from the command-line and don't mind supplying other tools to edit applications, profile executables, or browse class libraries. Select the Borland compiler, if you have the extra disk space for other tools or if you prefer a Presentation Manager front end to the code-writing and debugging process.

If you develop applications for PowerPC, then get MetaWare. IBM

says it'll have a compiler available for PowerPC cross-platform development. (It isn't available as I write this article.)

If you like Smalltalk's ability to build programs by object assembly (versus the more traditional approach: object construction), then consider IBM's Visual Age C++ compiler. It's the only Workplace Shell enabled product reviewed. **OS/2**

David Moskowitz is an OS/2 consultant, instructor, and programmer. He is also a contributing editor to OS/2 Magazine and coauthor of OS/2 Warp Unleashed. You can reach David at 76701.100@compuserve.com.

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Parse This!

BY DICK GORAN

Probably the single most powerful function of REXX is its string parsing ability. Parsing is breaking a string down into its component parts. It can be as simple as separating a sentence into individual words or as complex as extracting parts of a string in varying order. The PARSE instruction comes with many different options but the most impressive part of the PARSE instruction, and the most difficult for many users to grasp, is the use of templates with REXX's PARSE instruction. Table 1 contains the seven variations of the PARSE instruction. Table 2 contains a copy of the symbols that can be used in defining templates for the PARSE instruction. The template definition was taken from the *REXX Reference Summary Handbook*.

The simplest form of a parsing template consists of only variable names. The string being parsed is split up into words, and each successive word in the source string is assigned to a variable, in sequence from left to right. A word is considered to be any group of nonspace characters followed by a space. The last variable in the template is specially handled in that it receives any remaining data in the source string and may therefore contain multiple words. For example:

```
PARSE VALUE 'The quick red fox jumped.' WITH,
    Var1 Var2 Var3
```

Var1 would be assigned the value **The**, Var2 would be assigned

the value **quick**, and Var3 would be assigned the value **red fox jumped**. Leading and trailing space characters are removed from each word before being assigned to the variable. However, since the last variable receives all of the remaining data, it might contain both leading and trailing spaces.

Because of the unique handling of the last word in the source string that is being parsed, special care must be used in parsing strings such as that returned by the **SysFileTree()** function. **SysFileTree()** returns the date, time, size, and attributes assigned to a file followed by the full file system name of the file. However, the file system name is preceded by two spaces. Also, since file system names on an HPFS volume might contain spaces, the word-parsing capability of the PARSE instruction should not be used when extracting the fields returned by **SysFileTree()**. Rather, the file system name should be considered the remaining data. Using this technique requires that the spaces surrounding the file system name be removed. The following technique will handle all file system names returned by the **SysFileTree()** function:

```
parse value stem.n with,
    file_date,
    file_time,
    file_size,
    file_attr,
    file_path_and_name
file_path_and_name = STRIP( file_path_and_name )
```

All variables specified in a template are assigned a new value, regardless of the number of tokens, thus, a variable that

Fragment 1: Bi-directional positional PARSE template.

```
response = '1200*49798 081 054505 UTC'
parse value response with ' UTC',
    -06 UTC_hours      +02,
    UTC_minutes        +02,
    UTC_seconds        +02,
    -10 UTC_ddd        +03,
    -09 UTC_day_count  +05

say 'UTC_hours =' || UTC_hours || ' '
say 'UTC_minutes =' || UTC_minutes || ' '
say 'UTC_seconds =' || UTC_seconds || ' '
say 'UTC_ddd =' || UTC_ddd || ' '
say 'UTC_day_count =' || UTC_day_count || ' '
```

Fragment 2: Literal followed by positional.

```
string = 'abcdefghijklmnopqrstuvwxyz'
parse value string with,
    'def' +3,
    char1 +1,
    char2 +1,
    rest
say 'char1 =' || char1 || ' '
say 'char2 =' || char2 || ' '
say 'rest =' || rest || ' '
```


Table 1: PARSE formats.

PARSE [UPPER] ARG [template]: Parses the arguments according to *template* from a function or subroutine call, optionally first translating them to uppercase.

PARSE [UPPER] LINEIN [template]: Parses the input from the default character input stream according to *template*, optionally first translating it to uppercase.

PARSE [UPPER] PULL [template]: Parses the next line in the REXX data queue according to *template*, optionally first translating it to uppercase. If the queue is empty, lines will be read from the standard input stream (normally the keyboard).

PARSE [UPPER] SOURCE [template]: Parses the program's source information (three tokens) according to *template*, optionally first translating it to uppercase. For Example:

```
OS/2 COMMAND C:\OS2\REXXTRY.CMD
OS/2 SUBROUTINE D:\OS2\rexxtry.CMD
```

(If within a subroutine, information reflects parent.)

PARSE [UPPER] VALUE [expression] WITH [template]: Parses the value of expression according to *template*, optionally first translating it to uppercase.

PARSE [UPPER] VAR name [template]: Parses the value of name according to *template*, optionally first translating it to uppercase.

PARSE [UPPER] VERSION [template]: Parses the information describing the language processor and level followed by its date, according to *template*, optionally first translating it to uppercase. For example:

```
REXXSAA      4.00 08 Jul 1992
REXXSAA      4.00 10 Feb 1994
REXX/Personal 4.00 12 Oct 1994
```

doesn't get a token, because more variables exist than there are tokens in the source string, will be assigned a value of null ("").

A literal string can be used in a template to identify a delimiter rather than the implied delimiter of a space. For example:

```
PARSE VALUE 'Tues., Sept. 29, 1942' WITH,
          Var1 ',' Var2 Var3
```

would result in:

```
Var1 = "Tues."
Var2 = "Sept."
Var3 = "29, 1942"
```

Only the delimiter is removed from the string before the values are assigned to **Var1** and **Var2**. However, because the default delimiter of a space is used to separate the values assigned to **Var2** and **Var3**, we revert to the rules for parsing words. Therefore, the space preceding "Sept." is removed. Any combination of delimiters can be used in a single PARSE instruction.

A pattern can be specified in a variable and is indicated to the PARSE instruction by enclosing the variable name in parentheses. Thus, the above example could be written:

```
x = ','
PARSE VALUE 'Tues., Sept. 29, 1942' WITH,
          Var1 (x) Var2 Var3
```

and the same result would occur.

The next variation of the parsing template is the numeric positional pattern. This variation is similar to the literal string shown above, except that the numeric positional pattern indicates the position at which the next token from the source string begins. For example:

```
PARSE VALUE 'Tues., Sept. 29, 1942' WITH,
          Var1 5 Var2 12 Var3
```

results in:

```
Var1 = "Tues"
Var2 = "., Sept"
Var3 = ". 29, 1942"
```

The positional numbers can be relative to the last number used.

```
PARSE VALUE 'Tues., Sept. 29, 1942' WITH,
          Var1 5 Var2 +7 Var3
```

This option would yield the identical result as the previous example.

As with literal string patterns, the positional patterns can be specified as a variable by inserting the variable name in the template, enclosed in parentheses, in place of the number. An absolute position number is indicated by the use of an equal sign (=). The relative indicator (for example, +, -, or =) must precede the left parenthesis. Therefore, the above example could

Table 2: Templates.

variable name: the name of a variable to be assigned a value literally used to match within the input string.

(variable name): variable whose value is used to match the input string.

(period): a period is used as a placeholder that receives part of the input string, except that no assignment is actually performed.

integer: absolute character position in the input string.

=integer: same as preceding.

+integer: relative position in the input string.

-integer: same as preceding.

=(variable name): variable whose value specifies an absolute character position.

+(variable name): variable whose value specifies a relative character position.

-(variable name): same as preceding.

(In addition, a comma may be used in the template for PARSE ARG to indicate that the next argument becomes the input string for the following portion of the template.)

also be written as:

```
begin = 5
length = 7
string = 'Tues., Sept. 29, 1942'
PARSE VALUE string WITH,
    Var1 =(begin) Var2 +(length) Var3
```

Positional patterns can be used to extract fields bi-directionally. Fragment 1 contains an example of the PARSE instruction being used with a template that uses both literal and positional patterns. First, it finds the string "UTC", moves its pointer backward by a number of positions, and then moves its pointer forward. The string used in the example is typical of that returned by calling the Naval observatory to get the current time.

There is one *gotcha* you must watch for when mixing literal and positional patterns in a template. When switching to a positional pattern following a literal pattern, you must specify the length of the literal pattern before switching to a positional pattern. In Fragment 2, the explicit length of +3 must be used following the literal pattern of 'def' in order to assign the character g to the variable char1. **OS/2**

Dick Goran is the author of the REXX Reference Summary Handbook, an OS/2 reference. He has been in the computer industry since 1961 and was in the IBM mainframe systems software development business until 1987. He teaches OS/2 REXX to corporate clients and lectures on OS/2. His free REXX utility programs can be downloaded from OS2DF1, Lib 6 on CompuServe or FTPed from <ftp://ftp.cfs-rexx.com/pub>. He can be reached at CompuServe 71154,2002, or via the Internet dgoran@cfsrexx.com.

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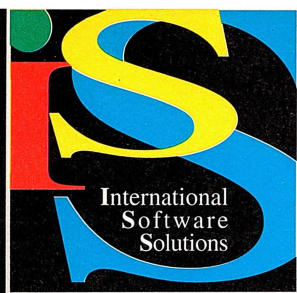
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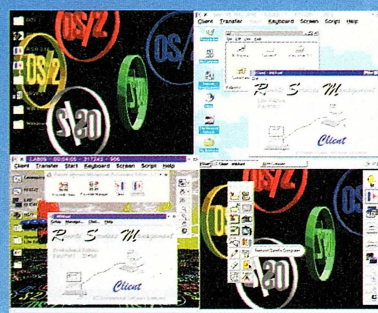
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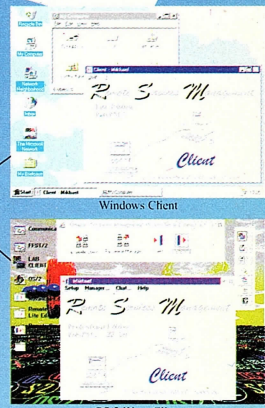
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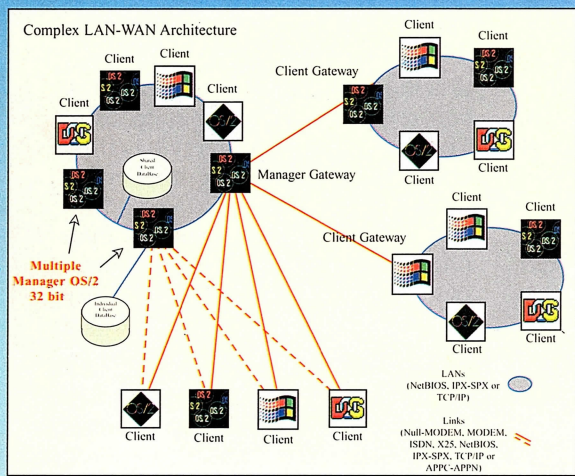
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Protecting Against Fault

BY WAYNE RASH, JR.

Hardware fails. Because personal computers have been around for as long as they have, we tend to think that hardware just runs, but sometimes it doesn't.

In a networking environment, where servers run 24 hours a day, seven days a week, the chances that something will go wrong increases in relation to the operational time accumulated by the machinery. To some extent, that's why we tend to buy network server equipment that's over-engineered. We buy heavy duty power supplies, for example, so that they'll run at a fraction of their rated load, meaning they run cooler and are less likely to fail.

Of course, engineering extends beyond the power supply into other parts of server design. Computers that are designed to be servers have a number of features that extend their lives, protect against failure, and provide redundancy in case failure happens anyway. These features might include extra cooling fans, stronger cases, or even hard disks that can be removed and replaced while the server runs.

Some manufacturers even design in more ways to protect their hardware. Digital Equipment Corp. (DEC), for example, makes the Prioris line of servers that is intended for heavy-duty, enterprise service. In these machines, DEC has added cooling fans that detect the failure of another fan or thermal overload and then increase speed or even bring additional fans on line. The case allows the mounting of up to seven hard disks that can be swapped in and out while the server runs. You also have the option to add redundant power supplies.

**Hardware is never
perfect. That's
why we back up
our network
server, right?**

Other server manufacturers, including NCR, Hewlett-Packard, and Compaq, include some of these features as well. While these servers are expensive, they are very reliable. (A machine with four Pentium processors and enough memory to be useful can cost over \$40,000.) Unfortunately, however, they're not perfect.

Of course hardware is never perfect, which is a lesson we learned long ago. That's why we back up our network server, right?

Redundancy

The fact that hardware sometimes fails is why we have redundancy. As useful as backup tapes might be, it's more useful not to need them at all. To do that, though, we need to make sure that a way exists to keep the hardware running even if something breaks. The most common way to protect the network is through disk mirroring.

Disk mirroring, which can be supported directly through LAN Server's or

OS/2 Warp Server's setup or through some types of hard disk controllers, means that the server maintains two identical copies of the same information. When a disk fails for any reason, the network operating system recognizes this failure, dismounts the failed disk, and uses the other one.

This process makes loss of data much less likely. While hard disks are highly reliable, data loss is nearly certain when they do fail. For this reason, when the operating system writes data to the primary disk, it also writes it to the secondary disk. This action slows down disk writes, but the difference is usually too small to be noticed by users and the improvement in security is substantial.

The next step up in redundancy is what's called disk duplexing. This process is similar to disk mirroring, but disk duplexing uses two separate disk controllers as well as separate disks. That way, you're protected against either failure of the disk drive or the drive controller.

Then there's RAID. This acronym once meant Redundant Array of Inexpensive Disks and was originally intended as a way to use cheap drives where expensive hardware was once used. As it happens, RAID turned out to be much more fault tolerant than other approaches, and it's now the choice for high-end servers and serious networking.

RAID gets its redundancy by spreading the data across several disks, ensuring the accuracy of that data by using one drive for parity information. With a RAID drive array, you can have one disk fail, replace it with a new disk, and have the disk controller replace the missing or corrupted information. The

process almost seems like magic when you actually try it.

RAID requires specialized disk controllers and each of the attached SCSI disks must be identical. To the network operating system, a RAID array looks like a single disk. You can also use the mirroring ability of your network operating system to mirror RAID arrays if you want to be really sure you don't lose any data.

When things really go bad

Of course, sometimes things really fail and you lose the entire computer. For most network administrators, this (fortunately very rare) event means that they have to pull a spare computer out of storage, set it up, and reconfigure it. If the administrator is lucky, the computer failure didn't damage the data on the disk drives, so the old drives can be attached, the new computer rebooted, and the network server will soon be running again.

Of course, this process requires that the replacement computer be nearly identical to the original computer, especially in terms of disk controller, network card slot assignments, and bus types. If you change those items, your network operating system might not run at all, so you could find yourself having to reconfigure your network before you can restore operations.

It's also likely that your computer sent some garbage to the disks during its death throes, which could mean that the drives are trashed along with the computer. In that case, recovering the information could mean a more lengthy process.

The problems that result with swapping out the computer platform are a major reason why network administrators usually plan on replacing the entire hardware platform and restoring the network data and the operating system from tape or they will reinstall the NOS and just restore the data. In the long run, the latter is easier.

In many companies, having a server down for several hours while it is being repaired and the data restored is an inconvenience, but little more than that. Some work won't be done and some workers will be unsettled, but through careful use of LAN Server's

directory replication and contingency planning, it shouldn't be a catastrophe.

Mission critical

Sometimes, however, having a server down for even a few minutes can be a catastrophe. In real mission-critical applications, you simply have no place for downtime of any sort. The server needs to be up and that's that.

So what do you do if the server platform itself fails? Simple. Have a spare already running, on line and ready-to-go. Even better, have the spare computer set up so that, when the primary computer dies, the spare takes over automatically and the users never even notice the interruption.

Novell Inc. addressed this problem several years ago with its System Fault Tolerant level III (SFT III) version of Netware 3.1. The problem with SFT III was that it required two completely identical servers linked by a separate FDDI network. With high-end systems, this amount of hardware can get expensive, and of course, it only works with NetWare servers. On the other hand, it works extremely well.

IBM, unfortunately, doesn't really have a solution to the level of fault tolerance offered by Novell. However, some other companies do. One company is Vinca Corp., which makes Standby Server 32 for OS/2 LAN Server.

Standby Server 32 has a number of advantages over Novell's approach, most notably that it doesn't require two identical computers. Instead, as long as both machines are capable of running LAN Server, both can support the attached network successfully, and both are licensed for the number of users you plan to use. It doesn't matter if anything else matches.

The Standby Server 32 approach makes life easier for network administrators because it adds a significant amount of flexibility. You can use computers for redundancy without spending another 40 grand on something that's really just there to meet a potential requirement. Of course, adding a less-capable spare as your redundant server might mean that users will get reduced performance while the spare is running things. In most companies, however, that's vastly preferable to being down.

Standby Server 32 works by having two specialized communications boards installed in the LAN Server platforms. These cards communicate with a specialized cable that allows high-speed data transfer outside of the network. This communication method keeps the servers in sync but doesn't add to network traffic.

Standby Server's \$3,000 price makes this option much less expensive than Novell's SFT III. The only potential downside is that Standby Server 32 depends on IBM's NetFinity product about which I have some reservations, even though I understand that IBM has fixed the problems that I reported last year (*OS/2 Magazine*, October 1995, p. 54).

Of course, Standby Server 32 does still require that you keep another computer running as a spare, and that requirement actually increases the chance that something will go wrong. Therefore, if you're planning such a system, you need to plan for more maintenance.

More maintenance? Yes, that's the price of redundancy. If another server is added to a network, the chances double that one of them will fail. While you're protected, if one does fail, you'll still need to fix it. With redundancy, you'll have more maintenance, but there'll be less risk that something will cost you the integrity of your network. **OS/2**

Wayne Rash, Jr. is a contributing editor and columnist for Communications Week. He's based in Washington D.C. and edits technology sections for The Washington Post. He can be reached at CompuServe 72205,221 or wrash@interamp.com.

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Meet MAXWAIT

BY MARK MINASI

Last month I looked at priorities in OS/2 multitasking. OS/2 multitasks using time-slicing, which means that it sets an internal timer and then gives control of the CPU to an application. When the timer goes off, the system drops what it's doing and jumps over to the scheduler, which is the dispatcher of the operating system. The scheduler wipes the sleep from its eyes, looks around, and says to itself, "What programs are in memory right at this moment?"

Once the scheduler looks over all the programs it says, "Which programs are ready to run?" It then looks at each one of them and examines their *priority*, which in the OS/2 world can be a hex value from 100 through 11F, 200 through 21F, 300 through 31F, or 800 through 81F (128 possible values in all). The scheduler then chooses the program with the highest priority, resets the timer, gives control to that highest-priority thread, and the scheduler returns to its cybernetic nap.

Sounds simple, hmmm? Well, this explanation is really just the quick and dirty version; allow me to clarify.

More details

First of all, when I said, "The scheduler gives control to a program," I was being sloppy. The scheduler schedules execution control on a thread-by-thread basis. A thread is a very simple, stripped-down program. What we'd think of as a program is probably, in OS/2 terms, a process, which is a collection of threads. Using a single-threaded process is perfectly reasonable, however, only the better-written

programs are designed in a multi-threaded way.

Second, the scheduler gets a bit more specific than simply asking which programs (threads) are ready to run? A thread can assume several states, for example: ready, active, sleeping and frozen, foreground, starved, I/O control, keyboard focus, and windowed. These threads aren't mutually exclusive; it's possible to have more than one of these characteristics.

Ready refers to ready to run. The thread isn't waiting around for any I/O to occur, but is in position to get its code executed. The scheduler chooses to give control to ready threads only when searching for a thread.

Active refers to the thread that's running now. Active is a kind of theoretical thread, as you'll never see it in a debugger. After all, if you're running a debugger, then the active thread is the debugger!

Sleeping and frozen threads are waiting for something to happen. If you've ever used the **DOSSLEEP** API, then you've created a sleeping thread. Sleeping threads put themselves in suspended animation for some preset amount of time. In contrast, frozen threads are in suspended animation until something happens. For example, if a thread is waiting for the file system to return some data from the disk, then the thread is frozen.

Ready, active, sleeping, and frozen are the states that describe whether or not the thread's have the CPU at the moment, and, if not, why not. These four states are mutually exclusive, and each thread will have one of those states. Other states describe whether

or not the thread deserves a boost in its priority due to some condition—the foreground, starved, I/O control, keyboard focus, and windowed states.

When, in the foreground, the thread reaches the eponymous (boy, have I been wanting to use that word in a column!) foreground state, it gets a boost in priority for being the foreground application. Applications also get a boost when they're reading the keyboard; this keyboard priority helps to ensure that whatever application you're currently working with gives you a good response time. Similarly, when trying to write to a window on the screen, a thread gets the windowed state, which further boosts priority.

Recall that interactive programs spend most of their time waiting for I/O, which probably means waiting for you to type something on the keyboard. Once the programs receive some I/O, they must use this data. At this point the program gets an I/O control priority boost. This boost happens one time only, because the thread receives it in the first timeslice after the I/O has been completed—just one priority boost per I/O transfer.

Starved is the last state and is the result of a busy system or one with a lot of high-priority threads. When a thread has been ready, but never gets the CPU, then it's said to be CPU starved. Low-priority threads can be perpetually starved, but CPU famine happens less than it could thanks to a parameter called **MAXWAIT**.

MAXWAIT is a parameter that you can include in *config.sys*. As part of its other duties, the OS/2 scheduler periodically checks all the ready threads to see if they're starved. **MAXWAIT** tells

Under the Hood

the system how often to check; its values are in seconds. When you install OS/2 out of the box, its default value is three, so the MAXWAIT check occurs every three seconds unless you modify your *config.sys*.

When the system does its starvation check, it finds all of the threads that don't have any CPU time in the last MAXWAIT seconds. Each of those threads gets a priority boost. That doesn't necessarily mean that they'll get any CPU time, but they might get closer to being the highest-priority thread and, thus, get the CPU's attention.

A, B, and C

For example, suppose you've got processes A, B, and C. Let's simplify and say that the priority values can be from 0 to 31—that's not true, but it's easier for our purposes here. Let me further simplify this example by saying that A, B, and C are all ready to run throughout this example, so the processes won't be waiting for any I/Os. Suppose that A's priority value is 15, B's is 13, and C's is 7. Suppose that the timeslice is one second and MAXWAIT is set to two seconds. At the first timeslice, the scheduler gives the CPU to A, the one with the highest priority.

One second goes by, along with another timeslice, which again goes to A. At the end of that timeslice, the scheduler looks around and notices that both B and C were starved for the last two seconds, so B's priority goes to 14 and C's to 8. However, A still gets the timeslice and the next one as well, because its priority of 15 is still greater than B's enhanced priority of 14.

Another two seconds go by and A's had the CPU for four seconds. A MAXWAIT polling period has now passed and B and C have been starved, so B's new priority is 15 and C's is 9. In the fifth timeslice, the scheduler sees two applications with priority 15, but because the scheduler is set up to avoid going to the same process over and over—that's how round-robin multitasking is accomplished amongst threads of equal priority—B gets a timeslice. Once B gets a timeslice, however, it loses the priority boost and drops back to its base priority of 13. The result of all these actions is

that timeslices 1 to 4 go to A, timeslice 5 goes to B, and timeslice 6 is back to A. MAXWAIT checks in again after the sixth timeslice. B wasn't starved, so it gets no priority boost, C is still nutritionally challenged, so its priority rises to 10. A stays at 15, B stays at 13, and C goes up to 10. You can now see what will happen next—in another four timeslices B will get a timeslice again, and much later C will get one.

What's a good value for MAXWAIT? Well, the smaller the value, the more often you'll push up the priority of the little guys. If I set MAXWAIT to one second in the example, then B would get its boost from 13 to 15 every two seconds rather than every four seconds. If you remove C from the calculation, then the sequence of timeslices would look like AABAABAAB..., and B would receive one third of the CPU time. Set MAXWAIT back to two seconds, and the sequence looks like AAAAB AAAAABA..., giving B one sixth of the CPU time. At the default value of three for MAXWAIT, you'd see AAAAAABAAAAAABAA... or one ninth of the CPU time going to B.

Actually, it's not quite exact to lowering MAXWAIT and assuming that the lower-priority processes will get more of the CPU. Another way to increase the share of time given to lower-priority processes is to increase the timeslice. If you set the timeslice to 10 seconds and MAXWAIT to one second, then B will get several priority boosts in one timeslice. Or, in other words, if you lower the ratio of MAXWAIT to TIMESLICE, you'll help out the lower-priority processes.

By the way, I'm not recommending that you make any changes. After all, the reason the low-priority threads are low priority is because they're less important, and you don't want CPU time spent on them when it could be used to give a snappier performance to the applications that you're using. OS/2

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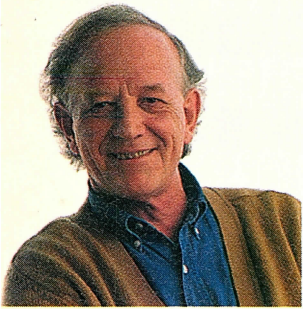
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Surviving the Next Big One

BY STAN KELLY-BOOTLE

As I remarked last month, our new One Vision *OS/2 Magazine*, so lyrically launched in Alan Zeichick's January 1996 editorial (*Perspectives*, p. 7), extends my target readership to the entire OS/2 community. And, by one of those weird Koestlerian coincidences, I've just received the ideal book for all OS/2 users and developers: *The Essential Distributed Objects Survival Guide* by Robert Orfali, Dan Harkey, and Jeri Edwards.

The authors are fluent, entertaining communicators and justly famed as OS/2 ambassadors. Orfali and Harkey design and evaluate client/server systems for IBM, while Edwards manages the transaction processing development team at Tandem Computers.

The Essential Distributed Objects Survival Guide (EDOSG) is the sequel to their widely acclaimed *Essential Client/Server Survival Guide* (ECSSG). ECSSG was voted Best Book of 1994 by the *Software Development/Jolt* judges, and I added my accolades in my February 1995 column (*End Notes*, p. 72). EDOSG repeats the winning ECSSG formula of jocular style, cartoons, opinionated soapboxes, and fascinating quotations from diverse gurus. However, EDOSG is reasonably self-contained. It retraces the basic client/server story, with lots of cut'n paste from ECSSG, before looking ahead to the next big leap based on components and distributed objects.

The word survival, now creeping into more and more computer book titles, suggests that the reader needs a guide through the jungle (perhaps minefield). Certainly the OS/2 community is facing a complex situation in the jostling, cross-platform client/server world of Windows, UNIX, MacOS, and,

as predicted by Ellison, Gerstner, and Nostradamus, the imminent dumb network-centric percolator. Yet, ironically, the emerging technologies—components, distributed objects, and acronym generators—leading to what Orfali, Harkey, and Edwards call the second client/server revolution, aim to simplify life for both user and developer.

The two major rival component architectures are Microsoft's proprietary OLE/COM (widespread, warts and all), and OpenDoc (just emerging, pure and virginal). OpenDoc is an open, vendor-neutral standard supported by IBM, Apple, Adobe, Novell, Oracle, and over 300 other vendors and related standards associations. OpenDoc is OMG/CORBA compliant and was designed to interoperate with OLE objects, thereby avoiding the usual "either-or" agony between rival standards. Microsoft, so far, has ignored both OpenDoc and the industry-wide OMG/CORBA initiative, but, as shown by Gates's recent Microsoft Network *volte-face* in favor of Internet/Java, "Economics always transcends theology" (K. Marx).

Of immense significance to the OS/2 community is the fact that Microsoft is about two years behind IBM in implementing distributed objects, the key to this next generation of client/server technology. OLE will not publicly match IBM's DSOM until Cairo is released, maybe in 1997.

Having whetted your appetite, I urge you to read the full, fascinating story of OLE, CORBA, and OpenDoc in EDOSG. Without a daily update, though, expecting the full story from any book is over-optimistic. Several such events have occurred since EDOSG was published: Kaleida has vanished, Taligent and Apple

have downsized, and Novell's OpenDoc involvement is dubious. Happily, IBM has taken over Novell's implementation of OpenDoc for Windows as well as Novell's ComponentGlue technology for OpenDoc/OLE interoperability.

EDOSG, like ECSSG, has a foreword by Zog the Martian, who reappears from time to time to question our Earthly quirks. This fact, I'm afraid, will turn off some readers, especially those in the Albanian Royalist community. (King Zog I of Albania [1895-1961] was deposed by the Italian fascists in 1939 and formally abdicated in 1946.)

Summary:

This book lives up to its title—it's the essential starter text for non-Albanian Royalists who seek a coherent overview of OMG/CORBA, DCE, OpenDoc/SOM/DSOM, OLE/COM. A comprehensive bibliography is provided for those who want to dig deeper into the technical detail. **OS/2**

Stan Kelly-Bootle started computing on EDSAC I at Cambridge over 40 years ago. His latest book is *The Computer Contradiction* (1995, MIT Press). He welcomes e-mail via CompuServe 70323,1560 or Internet skb@crl.com. Try his Web home page: <http://www.crl.com/~skb>.

Resources:

The Essential Distributed Objects Survival Guide (\$29.95)

Robert Orfali, Dan Harkey, and Jeri Edwards
John Wiley & Sons Inc.
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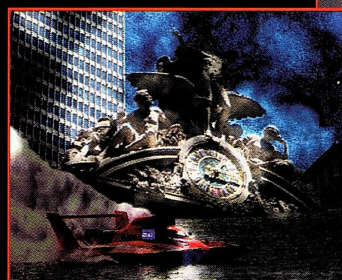
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